THE MARINE REVIEW

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Some Special Numbers

THE March issue of THE MARINE REVIEW will be a Fitting-Out number. There has rarely been a time in the history of water-borne commerce when ships were as busy as they are now, or as busy as they will be during the current year. The port-to-port commerce of the world was never as heavy as now, and the movement is really worldwide. Cargo space is just as difficult to get in English and German ports as it is in New York. There is absolutely no comparison between the present period and any similar period of maritime activity. There has been nothing like it in all history. It is the best period that ship owners have ever known. It appears to be a revival which embraces the whole world, for the commodity movement is quite as notable in Australia as it is in the United States. Steamship owners and ship brokers have no explanation to offer as to the cause of the revival. All they have to say is that the tonnage handled is something wonderful and the rates very profitable, but economists attribute the tremendous distribution to the recovery from the panic of 1907 and point to 1881 and 1896, when a worldwide movement began, following panics. But these movements were nothing like the present. The movement obviously has had direct influence on the ship yards, which are very busy altering old vessels and building new ones for the trade. What is being done to equip American vessels for their part in this movement will be dealt with in the Fitting-Out number.

The June issue will be devoted to the great International Congress of Navigation, which opens in Philadelphia May 23. This will be the first meeting of the International Congress in the United States and many questions of great importance to the marine engineer and naval architect will be discussed. The foremost engineering authorities of the world will be present. What will be the dimensions of seagoing vessels of the future? This question is of vast importance and will be treated thoroughly at the conference. The construction of harbors, dry docks, canals and canal locks, are intimately associated with this problem. When E. L. Corthell, the celebrated engineer of New York, predicted at the Eighth International Congress in 1900 in Paris that before 1923 there would be vessels afloat of 765 ft. length, 80 ft. breadth and 31 ft. draught, his prophecy was received with amusement; yet just seven years later the Cunard line built two steamers which exceed these dimensions in every respect and much greater ones have been built since. Some distinguished engineers are already predicting that the ship lanes of the north Atlantic will be navigated by vessels 1,500 ft. long, 160 ft. wide, with a draught of more than 50 ft. Every great European port, including Hamburg, Antwerp and Rotterdam, will send their great engineering authorities to this congress.

Shall there be an international agreement which shall fix a standard depth of water to which the important harbors of the world should be improved? To what degree shall American seaports make possible the continual expansion in the size of American liners? These questions will be thoroughly debated, the lead being taken by C. E. Grunsky, one of the consulting engineers for the Panama canal. Mr. Grunsky maintains that there should be an international agreement fixing the depth of water at low tide in important harbors. The lock dimensions of the Panama canal obviously put a limit upon the size of vessels that can use that waterway. The lock length is 1,000 ft., width 110 ft., and depth over sills 41.5 ft., which is about equal to 40 ft. draught in salt water. When completed, the Panama canal will be the only canal that can pass the Olympic and Titanic. The Kaiser Wilhelm canal is inadequate and is undergoing enlargement, and the Suez canal is being deepened.

The International Congress will bring together a great body of distinguished engineers, and it is well worthy of a special issue.

The October issue of THE MARINE REVIEW will be devoted to the Panama canal. As known, this great engineering feat was undertaken solely by the United States and has been prosecuted with great vigor. Ordinarily, enterprises of this character are not completed until long after schedule time, but the Panama canal is going to be completed ahead of time and will, in a little more than a year from the date of this edition, be opened to navigation. This edition will treat of the canal in all its phases, constructive, strategic and commercial. Undoubtedly, its existence will bring into being hundreds of enterprises as yet undreamed of. The Panama canal is an achievement, of which the whole American people have reason to be proud.

The December issue will be known as the Marine Engineer and Naval Architects' Number, and will be made of exceptional interest to them, containing not alone the complete discussion of the fall meeting of the Society of Naval Architects and Marine Engineers and a condensation of the papers to be read at the meeting, but a survey of all the leading events of importance to them that may have occurred in all parts of the world. It will be one of the most important numbers of the year and the services of experts will be enlisted to make it a crowning feature. No one interested in the subject can afford to be without this issue.

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The Toiler and Her Experiences

Her Performance on the Lakes

THE Toiler, fitted with Diesel oil engines, has now been on the lakes for some months and certain facts concerning her performance are gradually being made public. It is known that she crossed the Atlantic ocean from Middlesborough to Halifax in the wildest kind of weather in thirty-four days, carrying a cargo of 2,000 tons. Considering her low power this performance was quite respectable. The engine behaved splendidly, but it is understood that trouble was caused by salt water getting down the gas escape pipes into the oil tanks. This salt water, mixed with oil, formed a kind of emulsion and in spite of efforts being made to free the oil, some of the salt water got into the cylinders. The consequence was that the engine upon arrival at Montreal was not in good shape but as the lake season was drawing to a close she was dispatched to Port Colborne for her first cargo.

It was found that the Toiler on the limited dimensions prescribed by the canal locks carried greatly in excess of any previous vessel built for this service. She loaded 94,000 bu. at the Port Colborne elevator, which is practically 10,000 bu. more than has ever passed through the Welland canal on 14 ft. draught. The stowage of cargo was also greatly facilitated by the saving in space effected by the use of oil engines.

The Engine Handled Easily.

In spite of the fact that the engines were in poor shape, the operator handled them most successfully. The reversing was simple and reliable and one man could operate both engines with the greatest ease. In the canals the engine arrangement was most satisfactory, but in the currents in the St. Lawrence river and in going into the locks it was found that the small twin-screw propellers could not hold her back sufficiently quick to make it safe to handle her in the ordinary way. It should be added, however, that the crew was green and not accustomed to canal and lock conditions. The trip from Montreal to Port Colborne and return was completed in thirteen days, which is three days longer than the usual type of steamer takes. The economy of fuel was most remarkable. It is well known that the ordinary Diesel engine does not burn more than half a pound of crude oil per hour or about a quarter or a fifth of what a steamer with ordinary triple-expansion engines consumes. It was found that the Toiler could make the round trip to Port Colborne on 8 tons of fuel.

It should also be added that the Toiler tied up nights so as to avoid any possibility of damage. Obviously the oil engine is singularly adapted to a service where interrupted conditions in running are likely to be encountered because there is no loss of fuel as in a steamer with boilers. Commenting on the performance of the Toiler, a correspondent writes as follows:

Electric Transmission Gear.

"It is now known that the results of the Toiler would have been greatly improved if electric transmission gear had been fitted between the engine and propeller. It is found in loaded condition that the engines cannot develop their full power as the revolutions are cut short by the propeller holding up the engine. On the other hand in light condition the engines get away with the full revolutions and develop their full horsepower. It is essential on this type of boat that some form of transmission gear should be adopted and it may be stated that arrangements are now being made for the construction of a further vessel of this type with somewhat larger power and with electric transmission gear. A further advantage of this arrangement is that one or any of the generating units can be shut down for adjustment, which is an important matter in regard to the Diesel engine. If any one cylinder is found to be skipping, the engineer is at once informed by the change of the ignition periods and it is important that the trouble be at once located and an adjustment made, otherwise oil may be injected into the cylinders and not burned.

"It is impossible to make such adjustment when the engines are coupled direct on the propellers as the vessel is at once out of control if the engines are stopped. This is a serious matter in such conditions as are found in St. Lawrence river currents. The experiment has, however, demonstrated most successfully the possibility underlying the Diesel engine and there can be no question that this form of motor must be reckoned with on the lakes. Any troubles with the machinery are purely mechanical and can easily be taken care of by competent people. The engines should be in the hands of those who have watched their manufacture so that those operating them may have a clear understanding of what is going on and to the end also that a staff of trained engineers may be developed. Personally I rather deprecate the use of the reversing type of engine. It is my opinion that the Diesel engine runs much more advantageously if the reversing feature is done away with. This is particularly the case in the canal trade where there may be as many as twenty or thirty locks in a series requiring heavy locking, backing and filling of the engine. It is for this reason that I advocate an electric transmission gear so as to make the reversing of the propeller a simple matter of switching. There are, of course, other transmission systems, such as Foetinger, which are also applicable, but in this case the crank shafting and propeller shafting must be in one line, whereas in electric equipment the engines may be placed anywhere suitable and connections made by wiring to the propeller motor."

Coast Yards Busy

That the ship yards of the east are in for a period of activity is evidenced by orders already placed or about to be placed. The Coastwise Steamship Co. has given contrict to the New York Ship Building Co. for a steamer to carry 7,500 tons. W. R. Grace & Co. have given Cramps, Philadelphia, an order for a 10,000-ton vessel and it is reported that the Southern Pacific railway intends to order four ships. The Standard Oil Co. is also going to add to its floating equipment.

The Thomas Furnace Co., Milwaukee, Wis., has given a contract to the Variety Iron & Steel Works Co., of Cleveland, for a steel bridge electrically equipped for handling a 6½-ton bucket. The bridge will have a capacity of about 250 tons per hour.

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Raising the Dry Dock Dewey

THE dry dock Dewey, which sank at Olongapo, Subic bay, Philippine Islands, in May, 1910, is a steel floating dock, 501 ft. over all and 100 ft. wide, with a lifting capacity of 20,000 tons. On the afternoon of May 23, 1910, the dock was lowered to a depth of 26 ft. over the keel blocks, leaving a freeboard of 15 ft. on the side walls. The lowering of the dock a night in advance was in accordance with the usual custom of having the dock in readiness and thus avoiding delay. In the early morning it was noted that the dock had taken a slight list to port. The watchman corrected this by admitting water, but the list again appeared and the dock finally sank from causes then unknown. The raising of the dock formed an interesting paper by Naval Constructor L. S. Adams before the recent meeting of the Society of Naval Architects and Marine Engineers, in New York, to which William T. Donnelly, the well-known dock designer, contributed some valuable discussion. Mr. Donnelly said:

WILLIAM T. DONNELLY

Credit to the Men.

"In contributing to the discussion of this paper, I feel that I must somewhat reverse the order of the subjects as considered by the paper. To me the most important part is the personal achievement of the men who accomplished the work of raising the dock. We, the engineers, can plan and cause construction to be created, but after completed and tested they pass out of our charge and care, and in this instance we have an example of a structure requiring about two years for its completion at a cost of approximately $1,500,000, being to all intents and purposes completely lost or rendered practically valueless within a few hours, save for the knowledge and energy of those engineers who happened to be on hand at that particular time, and to them I wish to pay the tribute which I consider due; that is, that the knowledge and ability shown in raising and floating the dry dock Dewey under the conditions, was as great or greater than that required to design and construct the dock.

"To lay out the work for the month's campaign which resulted so satisfactorily, was a stupendous undertaking. The paper deals with only the barest details of the accomplishment. The getting together and connecting up of the pumps with their steam and water piping, the gathering of vessels and floats to provide the necessary power, the building of the cofferdams, and the correlating of all this equipment to get the most out of it in the very short time that the continued operation, day and night under high pressure, is a test which tries out men and material, and the successful accomplishment of the work should not pass without its proper recognition by engineers, and I, for one, am glad to have the opportunity to acknowledge the high quality of the work.

High Moral Courage.

"The second important feature of this paper, to which I should like to call attention, is the very high appreciation I have for the bureau of yards and docks, and the naval construction bureau for the very frank and complete manner in which this information has been presented. My entire engineering experience leads me to believe that it takes the very highest kind of moral courage to allow all the facts to speak for themselves under all circumstances, and I am equally certain that, given this courage, the result will always more than justify the action.

"Floating dry docks are of very great importance, both from a military and commercial point of view, and may be said to be an absolute necessity. The number, however, is very limited relative to ships, and our experimental and recorded knowledge relative to their operation is correspondingly limited. Therefore, the knowledge contained in this paper is of the very greatest importance to those who, like myself, are earnestly studying the problem of their construction.

"I should now like to take up some of the matters of information which the paper contains and comment upon them relative to the effect they should have upon the future design and construction of floating dry docks.

"Generally speaking, it would seem that the cause of the sinking of this dock was, first, the corrosion of the air discharge pipes, which, being submerged when the dock was lowered allowed water to enter on the port side, causing the dock to list, and that, as soon as this list was established, the water commenced to flow from the high side to the low side through the center bulkhead, through deteriorated pipe connections to the various compartments and through leaky valves, and that, as the list increased, the corresponding flow of water also increased very rapidly, resulting in that side of the dock becoming entirely submerged until it rested upon the bottom.

Leakage Through Center Bulkhead.

"As an indication of the amount of leakage through the center bulkhead, the experience in raising the dock is quite conclusive. It appears that, with a considerable inclination, it was more than could be handled by a 24-in. centrifugal pump. Part of this was through leaky valves and defective piping, but a great portion must have been through defects in the bulkhead itself. The inadequacy of the interior bulkheads was also shown by the fact that it was impossible to raise the dock with compressed air, the air escaping in one case through five bulkheads, one of which was the center bulkhead. Bearing these facts in mind, what are the lessons that we are to learn and the additional precautions that we should take hereafter in designing similar structures?

"First, I should like to point out that the dock was provided with pumping machinery only on one side and that, consequently, the center bulkhead was pierced with many pipes, upon the integrity of which and their valves the stability of the structure as a whole was entirely dependent. I should lay down as a positive rule that no openings whatever should be made through the center bulkhead of a floating dry dock and that every possible precaution should be taken to have this bulkhead absolutely watertight. I would call

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attention to the fact that it is extremely difficult to make and maintain watertight interior bulkheads, and I should lay down as a second rule that interior bulkheads, as such, should be reduced to the smallest number.

"It was quite definitely shown by the experience in raising this dock that the controlling of the pumping from a central point through piping is extremely difficult.

"I might refer to one point of the paper where it says: 'No matter which valves were open or closed, the pump took water from the high tanks before removing any from the low tanks.

"I would suggest as a third rule for careful consideration, that the subdivision and distribution of pumping units to the different compartments of a floating dry dock is a much more reliable and desirable method than by pipes and valves.

"I would also like to point out that in this floating dry dock there were no reserved chambers or compartments of a sufficient capacity to provide for the buoyancy of the structure entirely independent from these compartments used in lowering the docks. It would seem that there could be no good reason for this construction, and I would offer as a fourth suggestion that, in all large floating dry docks there should be provided watertight compartments entirely distinct from those used for lowering the dock, of sufficient capacity to carry the dock when lowered, and that these compartments should be provided with separate and distinct pumping machinery kept in working order and available for use whenever the dock is lowered.

"There are undoubtedly other suggestions that will occur to other members of the society, and I trust that they will be heard from.

"Regarding commercial floating dry docks, with which type I am more intimately acquainted, I should perhaps state that they are usually placed in a dredged berth, and that while the depth of water is sufficient to lower the dock to take the maximum draught for which it was designed, it is rarely or never deep enough to entirely submerge the dock. This is not, however, universally the case. In some ports, such as New Orleans and Seattle, the depth of water is very much greater than required, and in such localities special precautions must be taken. This is also true of the port of Prince Rupert, B. C. A paper relative to the dry dock for this port is to be read at this meeting, in which a novel method of guarding against entire submergence will be referred to."

Lake Carriers' Association

Wm. Livingstone

WHEN the immortal part of Rumsey takes its flight into the great unknown and its battered tenement of clay is laid to rest, the Lake Carriers' Association will have none to call them together, at least none of such vigor and unmeasured resource, for if a member does not go when he is told to go, Rumsey is as like as not to lift him bodily into the elevator. No association has ever had a more faithful servant and deep down in their hearts none is more appreciated. For 20 years this burly, bustling, dynamic creature has gathered the members together despite all obstacles, said obstacles being of uncommon variety.

The annual meeting of the association was held on Jan. 18 at Hotel Pontchartrain, Detroit, and the morning was spent in listening to President William Livingstone read his annual report, which has grown both in volume and interest. The report is thoroughly optimistic. While the year 1911 began badly it ended quite well and there is every reason to believe that 1912 will recoup whatever losses were experienced. The present outlook is most hopful. Mr. Livingstone's report is crammed with statistics sufficient to furnish food for many a magazine article, and one from which nearly every industry may derive some kind of comfort. Even the ship builder can look forward to 1912 with some composure, for while he may not have many bulk freighters to build, he will have a considerable number of other kinds of tonnage, notably passenger ships.

One of the earliest subjects taken up at the meeting was the conservation of lake levels, which was led by C. M. Heald, of Buffalo. The influence of the Chicago drainage canal has already lowered the level of Lake Michigan 1 in., and with constantly decreasing levels of water with consequently lighter loads, the capacity of the great ore carrier goes for naught. Mr. Heald thought that a joint commission should be created to study the subject or that it should be made a part of the duty of the International Waterways Commission. A resolution asking the government to look into the subject was adopted.

At the suggestion of C. D. Dyer, of Pittsburgh, a resolution was adopted urging the government to start work upon a fourth lock at the Sault as soon as possible. Mr. Dyer is the representative of a company which will, during 1912, have two vessels on the lakes that can pass through but one of the existing locks. If anything should happen to the lock these vessels would be idle.

The welfare plan occupied considerable attention of the members. J. H. Sheadle, vice president of the association, has given more time to it than any other member and led in the discussion. He thought the work entitled to a broader name than it holds, as it really means the industrial development of the workers of the great lakes, including owners, officers and sailors. He believed that each department has come into a broader understanding of the other and that better feeling now prevails than at any time hitherto. He spoke very enthusiastically of the plan of saving money. Sailors are naturally more circumscribed than any other class and have fewer opportunities to save. In conjunction with the Lake Carriers' Association the Cleveland Trust Co. undertook the work of creating a marine savings bank for sailors with the result that 600 men closed the season with accounts ranging from $50 to $200.

Mr. Sheadle was much impressed, however, by the amount of money that is lost by the men. There is no class of employes so greatly exposed and so little protected from depredation of this character as the sailor. What cities do for its citizens, Mr. Sheadle thought the vessel owners should do for their sailors. He believed that when a robbery of any sort occurred it should be immediately reported to the shipping commissioner with instructions to follow it up, the associations paying all expenses. Of the sum of $75,000 saved by the sailors during 1911, fully two-thirds of it was saved by crews aboard the Pittsburgh Steamship Co.'s

Rumsey and Terry

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fleet. Discussing this phase of the situation, Mr. Coulby said:

"I attribute a part of our success in this direction to our policy of paying by check. We will give a man one check, two checks or three checks, or whatever he wants for his month's work. But we never could have made a success of the check system or the savings plan by simply endorsing it. It's the fellow on the boat that gives it life and keeps it going. The captains can get it going and that boat saves the most money whose captain leads the list of depositors. There was a lot of opposition to the check system when we first introduced it, but I just called a few of the leading captains to the office and got them to see its advantages and they acted as missionaries among the rest. Now you could not get them broke of the check habit if you tried."

Turning to a general discussion of lake trade, Mr. Coulby said:

"This lake business will be a greater business in the future than it has been in the past. Probably in extremely dull years there is not going to be business for everybody, but there is no company engaged in the transportation of commodities that will ever have ships enough to do their business in good years. The situation has not changed a particle from the first day when I started in business. When the Minnesota Steamship Co. started building vessels the independent owner felt that he was deader than he ever was before; when Rockefeller began to build his ships the independent felt that he was done for. Still after that we have had some mighty good times. I am not worrying over the volume of freight. We will see the day, and we will probably see it sooner than you expected, when we will all be busy. What I am afraid of is that when that day comes we will not have the men to properly man these ships. That is one of the things we should busy ourselves with—getting an organization on our boats and in our fleets and take care of that time which is surely coming when we will all be busy. We will need every trained man that we can get aboard our ships.

"I know that there are a great many boats that have not done anything in the past year. But it has not been dull only on the lakes. I have the misfortune to be interested in two blast furnaces and I know that one has been ready for the match since the year before last, but it is not yet in commission. Fifty per cent of that plant has been out of commission longer than any boat represented here. All this dull time has not localized itself on these lakes."

Mr. Coulby urged a three-hour watch in the pilot house and three hours on deck. This has been the practice of the Pittsburgh Steamship Co. during the past year, but it is not generally followed by the other owners.

"The Pittsburgh company has made a lot of wheelsmen," said Mr. Coulby. "Why don't you do likewise? Why do you pay able-bodied seamen's wages to a man that can't do an able-bodied seaman's work? Isn't it better to have four men forward than two?"

The capital stock of the association was increased from $20,000 to $25,000. It was necessary to make this change to take care of the increasing tonnage. One share of stock represents 100 gross tons.

Officers were elected as follows: William Livingstone, president; J. H. Sheadle, vice president; Capt. George P. McKay, treasurer; George A. Marr, secretary; H. D. Goulder, counsel; A. R. Rumsey, chief shipping commissioner. C. W. Elphicke, Chicago; A. B. Wolvin, of Duluth, and F. W. Smith, of Milwaukee, were dropped from the board of directors. A. T. Kinney, of Cleveland, and J. J. Boland, of Buffalo, were added to the board, leaving two vacancies, T. T. Morford, a director, having died during the year.

The board at present stands as follows: J. H. Sheadle, Harry Coulby, Capt. John Mitchell, Harvey D. Goulder, W. C. Richardson, J. S. Ashley, S. P. Shane, Capt. Edward Morton, W. H. Becker, W. A. Hawgood, W. H. McGean, A. F. Harvey and A. T. Kinney, of Cleveland; William Livingstone, of Detroit; F. W. Gilchrist, of Alpena; D. Sullivan, of Chicago; J. J. Boland, J. J. H. Brown, Charles M. Heald and W. E. Lloyd, of Buffalo; G. A. Tomlinson, of Duluth; H. L. Shaw, S. P. Cranage, of Bay City; John Craig, of Toledo; H. S. Wilkinson, of Syracuse; W. M. Mills, of Tonawanda, and C. D. Dyer, of Pittsburgh.

The executive committee consists of Wm. Livingstone, J. H. Sheadle, Harry Coulby, J. J. H. Brown, Charles M. Heald, D. Sullivan, S. P. Shane and Capt. John Mitchell. H. S. Wilkinson was added to the list of alternates, which was the only change made.

The annual dinner was a splendid function, President Livingstone presiding as toastmaster. The principal address was made by John Barrett, director general Pan-American Union, who spoke on "Pan-American Commerce and the Panama Canal." His talk emphasized the wonderful commercial possibilities which lie to the south of us.

ANNUAL DINNER OF THE LAKE CARRIERS' ASSOCIATION

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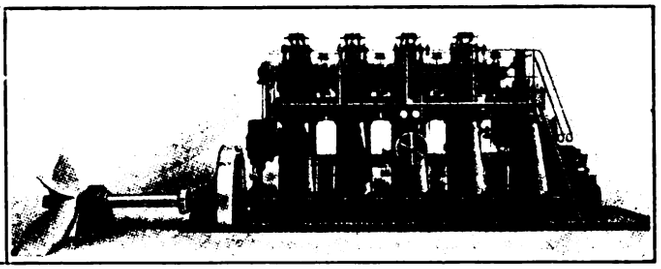
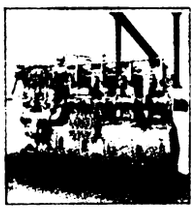
Diesel Engines

Their Advantages

By Sir J. Fortescue Flannery





NO IMPROVEMENT of the first magnitude in marine construction has been so long heralded and so late in general realization as the application of the internal combustion engine to big ships. The internal-combustion engine driving motor cars and motor launches is now so familiar as scarcely to awaken observation or comment. These engines are always of small power and nearly always of the type in which the explosive mixture of atmosphere and petrol vapor is ignited by an electric spark. It was Mr. Diesel who proposed to ignite the explosive mixture by the heat of the air compressed in the cylinder before the admission of the petroleum, so that the formation of the mixture and its explosion should be nearly simultaneous, and the loss es due to admixture in a separate chamber or carbureter, and the use of a separate dynamo or accumulator with wires and sparking plugs might be avoided, whilst their complication and risk of breakdown would also be eliminated.

Use of Crude Oil.

The high temperature at which the petroleum and atmosphere come together in the compression stage of the Diesel engine also facilitates the use of petroleum in a form less volatile than ordinary petroleum spirit, and, indeed, in some cases crude or even the residue of petroleum left after taking off the spirit and intermediate oils has been usable in the Diesel engine from this cause. There is a large production of residuum from the refineries of the oilfields, and the full solution of the problem of using it in marine engines is attractive alike to oil producers, to marine engineers, and to ship owners. It is attractive to oil producers because it would give them an extended market where the economical result is multiplied by the saving of weight in comparison with other fuels. It is attractive to marine engineers because the saving of weight in proportion to the power developed is very great as compared with the weight of steam engine and boiler combined, and it is attractive to the ship owner because the saving of weight and space, both in the machinery itself and still more in this fuel as compared with coal, would add greatly to the freight-earning power of ships, whether computed by weight or measurement. And yet the fate of the Diesel engine seems to have hung in the balance for three years or more, although it has been discussed and considered and piously approved by nearly everyone connected with ship construction and management.

Forgotten Difficulties.

The difficulties that first attended the use of liquid fuel at sea, in the form of a steam boiler combustible, are now almost forgotten, and today the economies claimed by Sir Marcus Samuel, who pioneered the ues of liquid fired steam boilers, are realized as a matter of course, easily and without doubt, experiment or anxiety. These economies are chiefly a reduction of 35 per cent in the weight of the fuel as compared with coal, a still greater increase in the storage room transferred from bunker space to cargo space, a reduction in the stokehold crew, and greater facility and less demurrage whilst bunkering. The drawback to the more general adoption of liquid fuel as a steam raiser at sea appears to be, for the navy, the question of international supply, and for the mercantile marine the margin of freight compared with the price of liquid fuel. If we are on the threshold of improvements in the combustion of liquid fuel by which, using it direct in the engine and eliminating the economic loss due to intermediate steam raising, we can obtain largely increased power in proportion to weight of fuel, then the margin between price of fuel and rate of cargo freight will be so broadened that ship owners can better afford to pay the comparatively high price which liquid fuel must always command relatively to coal, especially in the western hemisphere, where coal requires little and petroleum a great deal of transport from its place of origin. That this increase in probable future economic result may be great will be seen when it is stated that 1 ton of liquid fuel under a steam boiler will do the work of 1½ tons of coal used as a steam raiser, but that 1 ton of liquid fuel in an internal combustion engine will do the work of nearly 4 tons of coal under a steam boiler. The weight of the Diesel engine, with its air-compressors and other gear, is less than two-thirds the weight of steam engines and boilers of the same power.

We have seen, therefore, that the inducement to use liquid fuel is undoubted, even when the economy is estimated upon the results already attained in the limited experience for long sea voyages that has so far been made public. Why, then, is the progress so slow, and more especially slow in Great Britain as compared with the Continent, although British ship owners have very freely and very generally expressed their readiness to act on the new improvement, and oil producers have expressed their readiness to enter into contracts for terms of years long enough to provide every reasonable safeguard.

Caution of Marine Engineers.

The answer is to be found in the caution—perhaps undue caution — of the great body of our marine engineers. It is true that Messrs. Vickers have fitted submarines with successful Diesel engines, that Messrs. Swan, Hunter and Wigham Richardson built the Toiler nearly two years ago, fitted with oil engines, and that Messrs. Richardsons, Westgarth are building a Diesel engine cargo boat, and that Messrs. Doxford have one unit of a Diesel engine experimentally under construction, and that Messrs. Barclay Curle are building a large vessel on Continental account with Diesel engines of good power which will be ready for trial trip in February next. It is also true that my own firm have been responsible as consultants for sending to almost every one of our Colonial possessions many petrol and paraffine engines driving launches and tugs of medium size, but it is in Russia that a fleet of

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fair-sized oil-engine vessels has been working for some three years successfully on one of their inland seas; in Germany that there are large cruiser Diesel engines being built in Bavaria under the direct supervision of the German admiralty; in France that they have already fitted mercantile sailers with Diesel engines of considerable power, in Holland that they have built the most successful big Diesel engine for sea-going purposes, and in Belgium that a practical marine type Diesel engine has been evolved by the persevering skill oi Messrs. Carel of Ghent.

Diesel Engine Opens the Way.

There is no doubt that the Diesel engine, with its freedom from the easily derangeable mechanism of electric ignition has opened the way to the use of the internal combustion engine for marine purposes with a measure of safety that would never be possible to an engine dependent upon electric ignition. A motor car or a motor launch on river or lake service may be stopped on the road or river side and carefully tested in all the engine connections, but that would not do on a lee shore, and the comparative simplicity of the Diesel engine practically ensuring the continuity of its motion by its own valves and the steady supply of fuel has placed possibilities within the grasp of the marine engineer that otherwise would have been unattainable.

The necessity for being able to go astern instantly is obvious to everyone connected with ships, and the devices of double gearing permissible on land are out of the question for large powers at sea. The combined use of a storage of compressed air and a separate shaft actuating valves for reversing has quite overcome this difficulty, and, provided the storage of compressed air is ample and the details of the valve gear properly worked out, it is not too much to say that the ready starting and reversing of Diesel engines may be counted on with the same certainty as in the case of the steam engine.

Much interest has been shown in the problem of four-cycle and two-cycle engines of the Diesel type, the four-cycle being the earlier development, and the two-cycle being the design last adopted to increase the amount of power obtainable from cylinders of any given size. It may be of interest to describe generally the systems upon which the working of these two types is founded.

In the four-cycle type the piston on its first stroke draws in a full charge of air to the cylinder; the admission valve then closes, and the piston on its second stroke compresses the air to a small volume and a high pressure and a high temperature; the measure of liquid fuel is then, by means of a separate valve, admitted to this compressed hot air, forms with it an explosive mixture, which, in fact, ignites by reason of the high temperature of the compressed air, and gives the piston its impulse throughout the third stroke. The fourth stroke of this piston is occupied in the expulsion of the burnt gases, or scavenging as it is called, and at the end of the fourth stroke the engine is ready to resume its cycle of operations, receiving, as will be at once perceived, only one impulse for every four strokes—that is, only one impulse for every two revolutions of the shaft.

The Two-Cycle System.

In the two-cycle system the cylinder is first filled with a full charge of air from an air compressor reservoir, and the piston on its first stroke compresses this, and on its second stroke receives the impulse in the manner already described. At the end of the second stroke of the piston the cylinder is ready to receive a fresh charge of compressed air, which at the same time expels the foul gases of combustion and supplies fresh air for compression on the return stroke. Thus the cycle of operations is completed in two strokes, and twice the number of impulses is obtained as compared with the four-cycle system. In other words, twice the power—with some deduction for the weight of the separate air-compressing and storage machinery—is obtained from the two-cycle as compared with the four-cycle Diesel engine, and the special system of scavenging which is associated with the two-cycle system should favor the use of a less refined and therefore cheaper oil.

Driving of Auxiliaries.

The driving of the auxiliary machinery and winches has presented an interesting problem to those ship owners and engineers who have been endeavoring to adapt the Diesel engine. From the exhaust gases after explosion and expulsion from the cylinder much waste heat can be obtained, and this is available for heating the inlet air before it is taken into the main engine or raising steam for driving auxiliary and steering engines whilst the vessel is at sea, but the cargo gear cannot be so driven because the waste heat from the main engines is not available in port when the cargo gear is required. In the more recent designs on the Continent there is a separate auxiliary Diesel engine driving a dynamo which distributes current for auxiliary power throughout the ship, whereas in some earlier examples compressed air has been used to drive the auxiliaries and steering gear.

Accessibility of Working Parts.

The fashion of twin screws for large steamships, so wisely encouraged as an additional guarantee of safety, is very favorable to the Diesel engine because it adapts itself to high speed of revolution, and high speed of revolution is also favorable to the good and economical working of the Diesel engine.

There is one feature in which the successful Diesel marine engine must differ essentially from the petrol or paraffine engine of small size, and that is in the accessibility of its principal working parts, so that they may be available as much as a steam engine for observation when under way, and readily taken down separately for overhaul. The ordinary motor of small size is boxed up, is lubricated by pressure-fed lubricant, and none of its working parts are under observation. This, again, constitutes a risk legitimate enough on land or river, but impossible at sea, and all recent designs of Diesel motors for sea-going vessels have approximated more and more to the recognized open marine type, and must continue in the same direction to give satisfactory results.

Progress is assured, and in the near future the large powered internal combustion oil-driven ship will become a usual and regular construction, to the great advantage of those ship owners and engineers who are content to take upon themselves some of the burdens incidental to every new enterprise.

The Pusey & Jones Co., Wilmington, Del., are building a steel steam yacht for Wm. A. Lydon, Chicago, Ill. The yacht will be 212 ft. long over all, of 497 gross tons, and will be equipped with a four-cylinder, triple-expansion single-screw engine and Scotch boiler; estimated horsepower 1,000. This company is also building a steel steam yacht for F. C. Fletcher, of Boston Mass., to be 177 ft. over all, 450 gross tons, equipped with triple-expansion twin-screw engine and Almy boiler, 1,500 H. P.

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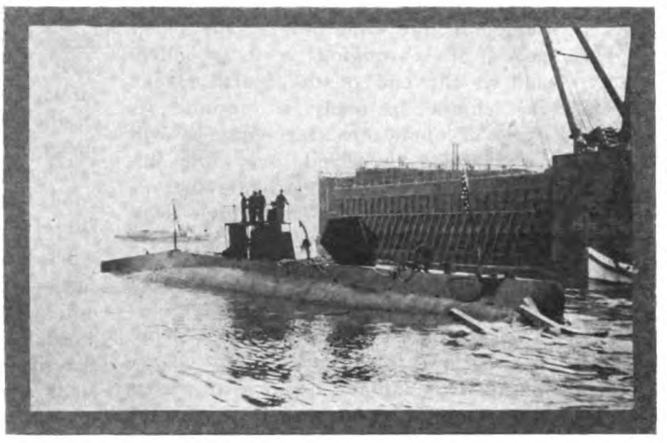
Development in Seattle

SEATTLE, Jan. 22.—The Moran Co., originally Moran Bros., a name identified with ship building on Puget Sound for many years, passed out of existence with the advent of 1912. The Seattle Construction & Drydock Co. is the name of the company which has taken over this plant and the change means the addition of about $1,250,000 in capital and the inauguration of extensive improvements which will make this plant one of the largest and most modern in this country.

President and General Manager J. V. Paterson, who holds the same titles under the reorganization, has long been making an effort to bring about the reorganization. His untiring efforts have at last been successful and he now sees the realization of hope long deferred in that there will now be an abundance of working capital and facilities which will make the local yard a strong competitor for all manner of marine and construction business on the Pacific coast.

The Seattle Construction & Dry Dock Co. is capitalized at $2,000,000. On the board of directors are several prominent and wealthy Seattle men as well as three representatives of Eastern capital. One of the first improvements which President Paterson has undertaken is the construction of a steel dry dock having a capacity of 12,000 tons. For years this plant has been handicapped by the lack of adequate docking facilities. Two long concrete piers will also be built and other extensive improvements made. From the yard of the Seattle Construction & Dry Dock Co., submarines F3 and F4 were launched on Jan. 6 and three days previously the huge caisson, built for the new Puget Sound dry dock, was sent into the water without a mishap. These events are of peculiar interest to the Pacific coast. They mark the approaching completion of the second dry dock at the Puget Sound yard as well as the nucleus of a fleet of submarines which Pacific coast people hope congress will build to guard the long shoreline on this side in lieu of a costly fleet of battleships.

The caisson measures 127 ft. in length, 47 ft. in height and varies in width from 20 to 25 ft. Owing to its unusual shape, it required careful calculation to send it down the ways successfully but it was launched without the slightest mishap.



LAUNCHING SUBMARINE F3

This caisson is the largest structure of its kind built for the United States government. In its construction were used more than 1,000 tons of steel while 450 tons of steel rails and cement ballast hold it upright. It will be an important unit of the new dry dock, rapidly approaching completion, which is designed to accommodate the largest vessels now afloat. Its width of 127 ft. and depth of 47 ft. as against a width of 99 ft. and depth of 38 ft., the dimensions of the caisson of the original dock, indicate how much larger is the second dock. The big caisson will be towed to the navy yard within a short time where it will be in readiness for installation whenever needed. Its cost is approximately $125,000.

LAUNCHING THE GATE OF THE NAVY YARD DRY DOCK

The F3 and F4 were originally named Pickerel and Skate but recently the department decided to make the change. They were christened by Mrs. Manson F. Backus, wife of a prominent Seattle banker, and incidentally the occasion was not only an event in the city's industrial history but likewise a notable social affair. The submarines, which have the appearance of huge whales, lay on the same way, one astern of the other. After the christening, the Seattle Construction & Dry Dock Co. served an elaborate luncheon at which the principal speaker was former U. S. Senator Samuel H. Piles, who assisted in securing the appropriation for these defenders. He paid a high tribute to President Paterson's ability and patriotism and stated that the construction of these submarines was a greater event in Seattle's history than the launching of the battleship Nebraska, which was built at the same yards. Mr. Piles made an urgent plea for united effort on the Pacific to induce congress to build a large fleet of submarines to protect these waters in lieu of a costly squadron of battleships and cruisers.

The submarines are each 142 ft. 7 in. in length, with depth of 16 ft. 10½ in. from keel to deck, and extreme breadth of 15 ft. 3 in. The noteworthy feature of these vessels is their great radius of action. Not only can they travel between all points along this coast but they are designed to make the run to Honolulu without escort. Kerosene is used as fuel, the engines being known as "heavy oil." Their total maximum radius of action is 3,200 miles and 2,400 minimum. Their displacement submerged is 400 tons. The engines are of the four-cycle type, six cylinders, having a collective horsepower of 780 when making 400 revolutions per minute.

Four torpedo tubes are installed in the bow, each tube carrying a 5.2 N.

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45 C. M. torpedo. Two reserve torpedoes can be carried on deck. The electric installation consists of storage battery, main and auxiliary motors, switch boards, lighting plant, heating plant and electric ranges for galley. The main motors develop 30 horsepower at 285 revolutions per minute.

Two air compressors and a storage system consisting of a large number of steel flasks arranged in batteries from which air can be drawn for expelling water from the various tanks are provided. This system also insures an ample supply of pure air throughout while the vessels are under water. There is a double set of periscopes to enable the commanding officers to get a clear view in the water when the vessels are submerged. The submarines are provided with submarine signal apparatus by which the presence of other vessels in the vicinity may be detected. The new fighting craft are each designed to carry eighteen men and every possible convenience is provided to make the submarines self supporting during long cruises.

The contracts for these vessels are held by the Electric Boat Co., which owns the patents, but the construction work was done entirely at the local plant. Frank W. Hibbs, Pacific coast representative of the Electric Boat Co., was unable to be present owing to illness but the company was represented by Samuel L. Bennett, Mr. Hibbs' assistant. They will have their trials shortly and under the contracts they will be required to make a speed of 14 knots on the surface and 11 knots submerged. These tests will include a 24-hour continuance performance and a 200-ft. dive. Each of these vessels represents a cost of about $500,000.

Four other submarines are on the ways at the local yards, two being for the Untied States navy and two for the Chilean government.

Holden A. Evans, formerly naval constructor in the United States navy, will be the vice president of the new ship yard. He has recently been on detached duty supervising the installation of efficiency systems in naval plants.

Great Lakes Protective Association

J. S. Ashley

THE Great Lakes Protective Association, which was organized to carry a part of the insurance of lake vessels with the thought in mind of reducing insurance premiums by minimizing the number of accidents, held its third annual meeting at Hotel Pontchartrain, in Detroit, Jan. 17. During the three years of its exictence this association has accomplished much, but it is apparent also that more remains to be accomplished. The problem of putting lake vessel insurance upon a thoroughly sensible basis is not an easy one to solve. As a general business proposition there is much about it that is unsound and until this is totally eradicated the business will always be unstable. To begin with there is a moral hazard which should not obtain. The arbitrary value of $53.50 per gross ton for steel tonnage, irrespective of its age, is altogether too high and in effect puts a premium upon careless navigation. Under this valuation a vessel that actually costs $285,000 cannot be insured for less than $340,000. She is in reality more valuable to her owners as a total loss than as a going ship. The desire of the Great Lakes Protective Association is to eliminate this moral hazard altogether and to have the vessel carry no more insurance than she is actually worth. In this connection it is their disposition to cut from the underwriters and to have the 5 per cent which they carry based upon the actual value of the vessel.

There was considerable discussion along this line which was participated in by Capt. D. Sullivan, C. M. Heald, C. D. Dyer and H. Coulby. Capt. Sullivan was particularly spirited in his discussion of the risk which the association was assuming on wooden ships. To illustrate, the F. H. Prince was insured for $40,000, a clause, however, limiting the liability to $30,000 in case of fire. The Prince, it was reported, had actually been purchased for $5,000, though her owners claimed through repairs and installation of unloading machinery she had cost in the neighborhood of $31,000. The Prince was destroyed by fire and the association paid its share of the loss of $30,000. In fact, the total losses on wooden tonnage cost the association 30 per cent, and Capt. Sullivan inquired with great pertinence as to whether the association should not have something to say concerning risks of this character.

Valuation and Rate of Premium.

Upon motion of Mr. Coulby the advisory committee was empowered to determine the valuation and rate of premium of wooden tonnage for insurance purposes, Harvey D. Goulder having held that the association had the right to exclude part of a member's fleet if it so elected.

W. M. Mills thought that the steel ships should be classified, believing that those with side tanks were safer and entitled to a lower rate. Capt. Sullivan pointed out, however, that the subtraction of tonnage for double-skin ships practically worked out to that end, but the advisory committee was instructed to take the general subject up with the underwriters and endeavor, if possible, to obtain a modification of the valuation of $53.50 per gross ton.

Percentage of Insurance.

"What we want to do," said Mr. Coulby, "is first of all to correct the valuation. We know that $53.50 is too high and that it involves a moral risk which we ought not to carry. We know also that the cost of a ship at today's prices is too low. Probably by the end of the year we will not be able to get ships at present cost. We would state our reasons clearly as to why we think the present system to be wrong and advance arguments as to what we regard to be a fair valuation for a ship."

Chairman J. S. Ashley, who presided at the meeting, stated that some of the members were in favor of increasing the amount of insurance to be carried by the association to 20 per cent. He said that he had no convictions on the subject, but desired a full expression as to the advisability of an increase from all the members.

Mr. Goulder considered that 5 per cent was not quite enough and thought it advisable to increase the amount to 10 per cent, with no thought, however, of ultimately doing a general insurance business. He held that vessel owners and underwriters should go hand in hand in the endeavor to so reduce the insurance

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risk that it would not be profitable for owners to carry their own insurance.

Mr. Coulby urged that the amount remain at 5 per cent for a period of five years, at the end of which he believed that definite and tangible results would be attained and that the association would then be in better shape to make demands upon the underwriters. He believed that there were many matters in the association more pressing than the actual percentage of insurance that the association itself should carry, notably the elimination of preventable accidents, and to this end the hearty cooperation of the captains was necessary. The association thereupon resolved to make no change during the present year.

Mr. Coulby's suggestion of a committee of captains was then taken up, Capt. John Mitchell, C. M. Heald and C. D. Dyer stating that they would be very glad to pay the expenses of any master of their fleet, who might be selected to attend a meeting of captains, in conjunction with the meeting of the Protective Association. The matter was eventually referred to the advisory committee, but a committee of captains will undoubtedly be formed in the near future to meet with the association and to devise rules and regulations that will seek to lessen the number of accidents. One fruitful cause of accident is the attempt to pass another steamer going in the same direction at the turning points in the rivers. Should a third steamer be met a mix-up is most likely to occur.

The association has reason to be pleased with the result of its operations. During the year 1909, the association lost $12,527.54, but the returns for 1910 indicate a profit of $30,588, notwithstanding that the tonnage of total losses under the 1910 policies was more than double that of 1909. This proves very conclusively that navigation during 1910 was much more carefully conducted than 1909, otherwise this heavy handicap would not have been overcome. The underwriters therefore have had a profitable year upon their risks upon vessels enrolled in the association and there is hope that this circumstance may be recognized when insurance premiums are fixed for next season.

The advisory committee was also authorized to establish an association membership to consist of fleets enrolled in the Lake Carriers' Association that are carrying their own insurance. The association members will pay a portion of the cost of operation and will conform to such rules for the navigation of their vessels as the association may deem wise and prudent. It is apparent that there is a determined disposition manifested all along the line to attack every problem that is involved in the general scheme of insurance and to put it upon such a basis as to make the field attractive to the underwriter. When that is done the rate will take care of itself.

Freight Handling in Port

CARGO transference at steamship terminals affords a striking field for the marine engineer. The adaptation of improved mechanical methods will increase the capacity of existing terminals and reduce the cost of handling freight. It offers a large field for the activities of marine engineers and architects and is one which has only latterly been fully recognized. Unavoidable necessity is now compelling the substitution of machinery for the armies of men employed in this class of freight movements. The normal proportional increase of general freight is more than two and one-half times that of the population and the proportion of package freight increase is at least twice that of general freight. This is largely the result of converting raw material into manufactured products at its place of origin and the great increase of manufacturing.

In coastwise transportation in the United States for large tonnage the terminal costs are greater than the carriage costs. As an example, the cost including cargo and terminal expenses to the transportation company per ton of freight for nearly 2,000 miles was $1.56, of which the labor terminal costs at both ends of the route were 79 cents. The estimated cost of the carriage of one ton of freight on the Erie canal in the proposed type of barge between Buffalo and New York is 26 cents, while terminal cost by manual labor will be more than 30 cents. It can therefore be appreciated what a field is offered for mechanical transference of freight at steamship terminals.

This topic was the subject of a valuable paper by H. McL. Harding, consulting engineer, at the recent meeting of the Society of Naval Architects and Marine Engineers in New York. He cited as one example of the awakening to the importance of this subject the installation of freight handling machinery at St. Louis by the Missouri, Kansas & Texas railway under the direction of S. B. Fisher, its chief engineer. The company has installed at a cost of $3,000,000 a freight terminal which depends absolutely upon mechanical methods instead of manual labor, handling everything from a crate of eggs to a grand piano.

This paper was abundantly illustrated and attracted a great deal of attention, being discussed by a number of members, as follows:

W. D. Forbes: — This paper is one of the most interesting to me that has ever been presented to our society. It is on a subject that has been given attention in a rather spasmodic manner, but which has substantially been neglected in the past. The transportation companies have been so much engrossed in getting material from one point to another that they have not given the attention they should have given to the matter of handling it after it has reached its destination; in other words, they have been, figuratively speaking, rushing water to a thirsty man with great speed, and have not given him even the poorest kind of facilities with which to drink it.

I have taken unusual interest in

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this subject, and in my observation the ludicrous side of it has presented itself to me. On one occasion I was watching the loading of freight cars at one of the terminals in New York City. One man came along with a 400 pound cage, and proceeded to put it in the cars. Directly after him came a man carrying three 5-16 in. carbon tubes bound to a stick, which weighed about 6 lbs., and he carried that the whole length of the pier, something like 500 ft.

Satisfactory System of Sheds.

I have studied this question and have come to the conclusion that the most satisfactory system of shed will be a two-story shed, the lower portion being absolutely free of freight, and used exclusively by the trucks; in other words, the trucks will come in on the lower level, enter the shed, and then go forward to the respective hoists or elevators in the terminal, and the second story will be devoted exclusively to the use of storing the freight. It costs very little more to hoist freight 20 ft., once you have hold of it, than it does to hoist it 10 ft. In hoisting the freight to the second story, I would have the whole central part of the second story open, and I would have a form of tramway on each side of the opening, on which freight could be moved, so that the freight could be elevated from the main floor and put on these tramways and taken to any part of the storage floor that was desired. In taking freight from the pier, you can have the team under the opening, and you can lower the freight on to the trucks with very little difficulty, and having the lower portion of the pier used only for trucks they can drive out and pass each other, because the docks will be so wide there will be ample room. You saw on some of the screens which have been shown, how congested the freight piers are—the horses seem to be swallowed by the freight. With the plan I suggest, I believe that could be entirely obviated.

I think the naval architect can with much benefit give a great deal of attention to arranging vessels so that the vertical hoist can be used. I think we can advantageously use the double deck system in our docks, the lower floor being used for trucking, and the second one for storage. With the present congestion on our piers and docks, there is much time lost, which results in a very costly detention of the vessels.

George A. Mattsson: — The last speaker mentioned the fact that the vessels have to wait a long time while the freight is being unloaded, and that much loss of time ensues. On the lakes it is just the opposite. In the ore trade vessels are loaded in an hour or two and unloaded in four or five hours. The capacity of our vessels on the lakes in freight handling have been largely increased, and are doing very much more business, simply because of the increased facilities for loading and unloading them.

Sir William Henry White:—I think, sir, that the author of this paper put his finger upon the fundamental principle of handling cargoes, when he said that all the arrangements for loading and unloading cargoes should be governed by the consideration of the service to be performed. While that is a very broad generalization, it is perfectly true,—I heartily endorse it, but it covers a great deal of ground. The views that we have seen thrown on the screen illustrate attempts which have been made to fulfill that condition, and how varied may be the solutions.

Work for the Naval Architect.

Now, speaking as a naval architect, I would like to say that the ship designer must, if he is going to help his end, make the ship the means of shipping or discharging cargo, and he must make his ship suitable for the service.

We saw an extreme illustration on the screen of the lake steamer, which was a wonderful illustration of how the designer of a ship may help rapid discharge of cargo which is essential to commercial success, but we, as naval architects, know perfectly well that such ships as those cannot be sent over the ocean to carry freight.

I am well aware that a whaleback once came to Liverpool—in fact, I went on board of her—well, she got there and got back again, and that is all that need be said. We know perfectly well that the attempt to adopt the whaleback system, which was made in England, resulted in the development of quite a different type, but it is a fact, which ought to be recognized, and which I always endeavor to bring into prominence, that in later years the greatest skill and the highest scientific work, in my judgment, that has been done in connection with ship construction has been done in connection with cargo steamers in England. We are so apt to think about the big steamer and the war ships, that we overlook the fact, and it is a fact, and I would like to repeat it, that the most remarkable developments and some of the most important applications in the construction of steamships have been in connection with cargo steamers; their whole structure, the equipment for handling cargo, the arrangement of the headers, and formation of the holds, so as to facilitate loading and discharging,—all these things have been taken into careful consideration in the construction of these cargo steamers.

Structural Strength of Ships.

Now, in carrying out these arrangements, designers have run up against difficulties in maintaining the structural strength of the ships which have been of the most serious character. I can tell you of cargo steamers which have sunk, a thing which we regard as ordinarily improbable, but they happened to do that because the cargoes they had to carry and the arrangement of the upper part left them without sufficient strength against compression. Now, these things have been studied in England, and those who have followed the matter will know there have been developed rival and competing types of steamers, which differ essentially from what was built ten years ago.

Well, now, what about the harbor authorities? In England in all the new docks, the construction of the dock and the arrangement of the warehouses is always had with relation to the handling of cargo, and if you wish to see how much attention has been devoted to that side of the subject in recent years as compared with what was formerly given to it, you would only need to go to Liverpool and walk by the docks, passing from the older docks to the later docks, and you will see the history of the development before your eyes.

In England we have one difficulty which I suppose here is not felt much. In some of our docks in England we have to deal, if I remember rightly, with a rise and fall of tide of as much as 40 ft. That is not a comfortable thing, in connection with the use of lifting appliances.

I was at Prince Rupert the other day, and I was told that there is a rise and fall of tide at that point amounting to 27 ft. In England we have come to the use of enclosed docks to a great extent, almost entirely. The ships can enter these enclosed docks, and a constant level of water can be maintained, in the relation of the ship to the wharf, and the latest development in England, after

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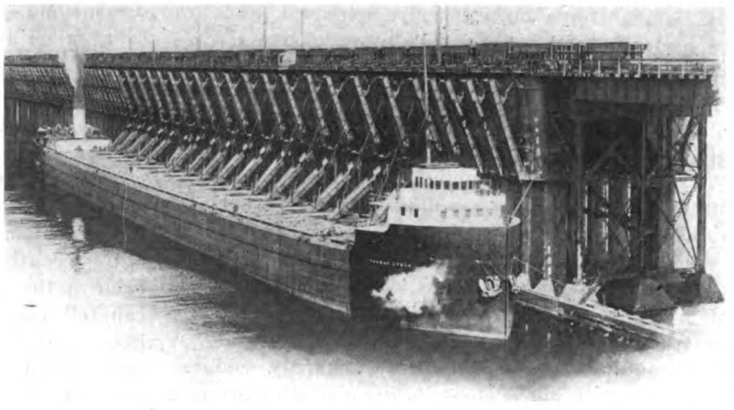
considering the whole matter, is that further enclosed docks are to be built. The key-note of the whole situation, as the author says, is consideration of the service to be performed, and then the co-operation of all concerned, civil engineers, mechanical and naval engineers, and port and harbor authorities, so as to get the best results.

New Ore Loading Docks

VESSEL owners failed to discount sufficiently the remarkable development in loading and unloading appliances on the lakes and found themselves quite suddenly with a surplus of ships on their hands. This development has been phenomenal and during the past year or two millions have been spent in modernizing the shipping and receiving docks. This article will have to do with the development that has recently taken place in docks for loading ore.



STEAMER THOMAS LYNCH AT THE GREAT NORTHERN ORE DOCK

When navigation opens in the spring, mariners will find a new dock at Presque Isle, Lake Superior, not the largest by any means, but one of the most efficient. This new dock belongs to the Lake Superior & Ishpeming Railway Co., and work upon it was begun on March 29 last. The dock proper has a length of 1,200 ft. and with its approach is 1,873 ft. long. There are 200 pockets, 100 on each side, spaced 12 ft. centers with a capacity of 250 tons each, making the storage capacity of the dock 50,000 tons. Its maximum shipping capacity in a full season is estimated at 3,000,000 tons. These docks are intended to ship and not to store ore and therefore storage capacity is small in relation to shipping capacity.

The dock is built upon wooden piles (A Fig. 1) which were driven 3 ft. centers and cut 4 in. below the water line. Sheet piling was placed outside and the enclosure filled with sand to within 6 in. of the top of the piles. This was covered with a 2½-ft. concrete slab reinforced with 1½-in. cables. The concrete piers extend 1½ ft. below and 5 ft. above water level. The method of setting the steel columns in the concrete piers was quite simple, the columns being erected on the piers and the concrete simply poured around them. Fig. 1D shows the abrupt slant of the ore pockets and with such pitch there is little likelihood of the ore jamming. In fact, the height of water level to hinge of spout is 43 ft., making a most precipitous incline. The spouts are 36 ft. long, 9 ft. wide at top and 4½ ft. wide at bottom. The detail of the steel work is well shown in Fig. 1B. Fig. 1C shows the top of the dock before the deck planking was laid. About 14,500 cu. yds of concrete were used in the substructure and 20,000 cu. yds. in the superstructure. About 5,000 tons of steel were used in the dock proper and about 1,500 tons in the approach trestle. The Raymond Concrete Pile Co., W. V. McMerriman, chief engineer, built the substructure. The Wisconsin Bridge & Iron Co., J. W. Marlborough, chief engineer, furnished the steel and erected the superstructure. R. C. Young, chief engineer of the Lake Superior & Ishpeming Railway Co., represented the owners in the construction of the dock.

New Dock at Two Harbors.

The Duluth & Iron Range railway (one of the Steel Corporation's railways to the iron mines) has recently completed at Two Harbors a new steel and concrete dock to replace the old wooden one. It is interesting to note that these loading docks have undergone a fundamental change since the first little trestle dock with its pockets and chutes was erected at Marquette. The principle remains the same and all improvements have merely been enlargements and the utilization of later agencies for power, such as electricity.

The new dock, known as No. 1, consists of three parts, a timber approach 225 ft. long, a steel approach 329 ft. long, and the dock proper, which is 1,376 ft. in length, 51 ft. 8 in. in width, exclusive of the machinery platforms, and 74 ft. in height above the mean water level of Lake Superior. There are 112 ore pockets on each side and the structure is designed to load four of the largest boats at one time. The dock is supported on piles surmounted by a reinforced concrete cap. The posts, girders and general frame work supporting and enclosing the ore pockets, are structural steel, and the partitions between the bins are reinforced concrete. This latter feature constitutes one of the chief characteristics of the structure. The bottoms and fronts of the bins are of wood on steel framing and the slope of the ore pockets is 48 degrees from horizontal, being three degrees steeper than in other docks constructed by this company, and materially assisting the flow of ore.

Electric hoists are used for raising and lowering the ore spouts instead of the hand-operated winches, which have been exclusively employed heretofore. The use of power for this purpose will be greatly appreciated. In addition the dock is provided with an improved chute equipped with doors which are guided at the bottom and which can, if necessary, be closed against the flow of ore without difficulty. This is certainly an innovation which vessel masters will be thankful for. Frequently they have had to take more ore than they wanted in certain parts of the boat, owing to inability to stop the flow. The general features of this dock are shown in Fig. 2.

The timber approach, which is 225 ft. long, consists of 14 bents spaced 15 ft. centers and framed in the usual manner with suitable longitudinal bracing. The bents are supported on piles. The tracks, two in number, are carried on 8 x 16 in. stringers laid on the caps. The ties are sawed 8 x 8 in. in section and 14 ft. long. The first three bents at the inner end of the timber approach are set on a 9-degree, 30-minute curve and the bal-

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ance of the approaches and dock proper are, of course, straight. The steel approach, which is 317 ft. in length, is situated between the dock and the timber approach. It consists of four towers connected by plate girders as indicated in Fig. 3. It is widened at the top so as to accommodate four tracks at the outer end. The girders between the towers are 63 ft. in length, while those over the towers are 32 ft. long. From bent 1 to bent 5 there are four girders; between bents 5 and 6 there are five 32-ft. girders and from bent 6 to the outer end of the approach there are six girders, this additional support at the outer end being necessary to take care of the four tracks. The framing of the tower is clearly indicated in Fig. 3, each bent being provided with three columns. The columns rest on concrete pedestals supported in turn by close-driven groups of piling. The dock proper is level, but the approach has a rising grade of 0.304 per cent towards the dock.

The details of the chute and door are shown in Fig. 4. The latter is especially interesting. Its lower edge is guided by a link (L-Fig. 4.), the upper end of which slides in the slot S. The pressure of the ore in the pockets cannot open the door so long as the dog shown in the illustration prevents the upper end of the link, L, from sliding freely in the slot. This dog is controlled by the lever V, which extends up to the operating platform. When the lever is rotated the dog swings clear of the slot and the lower edge of the door is then free to move. The movement of the upper edge of the door is controlled by the vertical slot T. The door is counterweighted, as indicated, so that it moves easily. In operation as soon as the dog is released the door is drawn into the pocket P, leaving the full cross section of the chute free for the flow of the ore. When it is desired to cut off the flow the door is lowered and since the lower edge is guided it is forced into the stream of ore as it descends. The links and slots are so adjusted that the door describes a certain curve in raising and lowering with the effect that the resultant pressure from the flowing ore does not interfere with or prevent its crowding.

Whitney Bros. & Hill, of Superior, Wis., built the foundations for the dock, and the steel structure was fabricated and erected by the American Bridge Co. The work was done under the supervision of W. A. Clark, chief engineer of the Duluth & Iron Range railway.

New Dock at Superior.

The Great Northern railway placed in commission last season at Superior its new concrete ore dock equipped with 151 double ore pockets with a capacity of 325 tons each, making a total storage of 98,150 tons. This dock is assured of heavy tonnage for the next three years at least, as under the terms of the Hill ore lease the Steel Corporation's shipments during the remainder of the life of the lease will run into many millions annually. Solid concrete columns are used to support the bins instead of the structural steel posts which have been employed heretofore. The walls of the bins, instead of being merely partitions, act as beams and carry the weight of the ore, the bin floors being supported on I-beam purlins, extending between the supporting walls or partitions, as shown in Fig. 5.

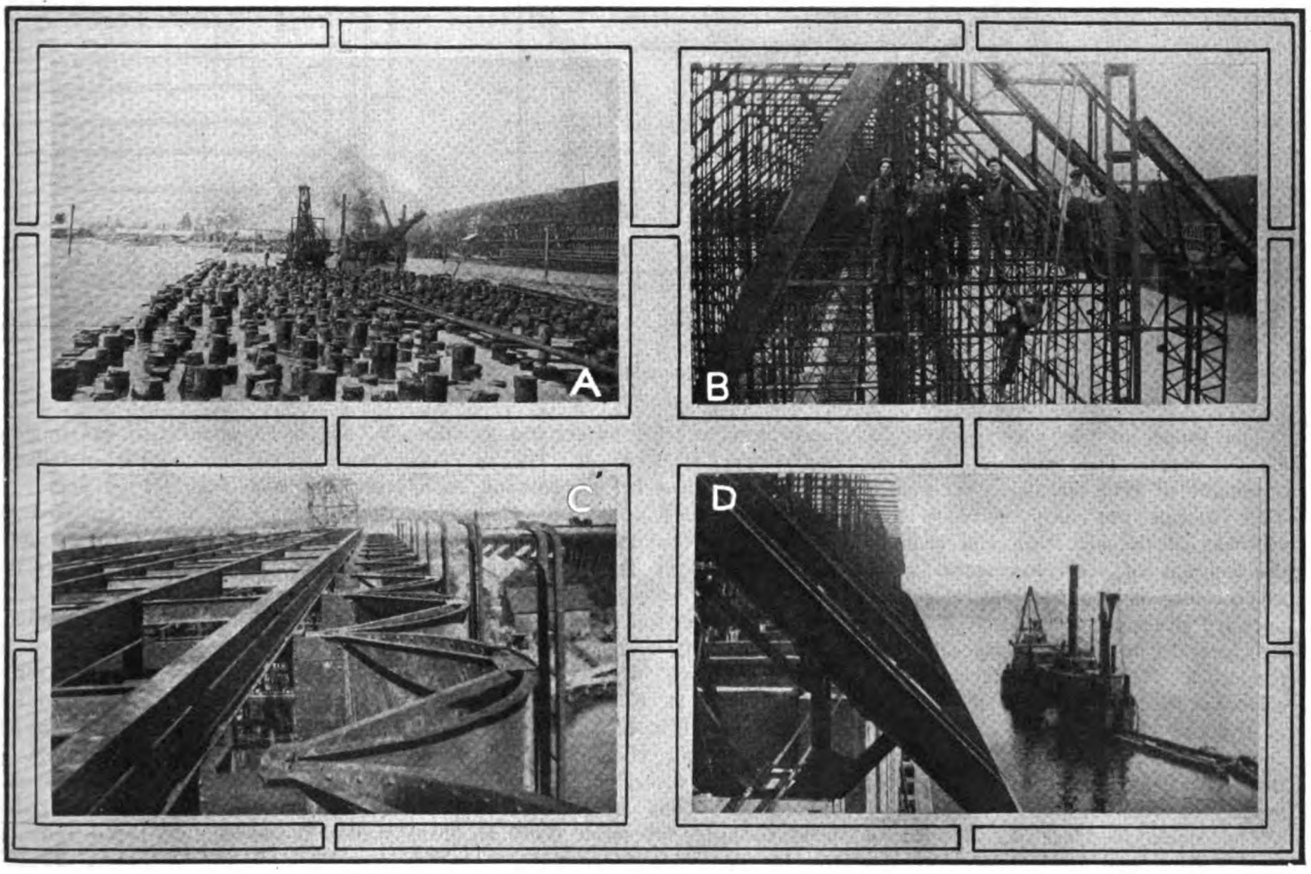

FIG. 1—*A*—WOODEN PILING FOR FOUNDATION OF PRESQUE ISLE ORE DOCK; *B*—DETAIL OF STEEL REINFORCEMENT; *C*—TOP OF DOCK BEFORE LAYING PLANKING; *D*—SIDE VIEW OF DOCK, SHOWING SLANT OF ORE POCKETS.

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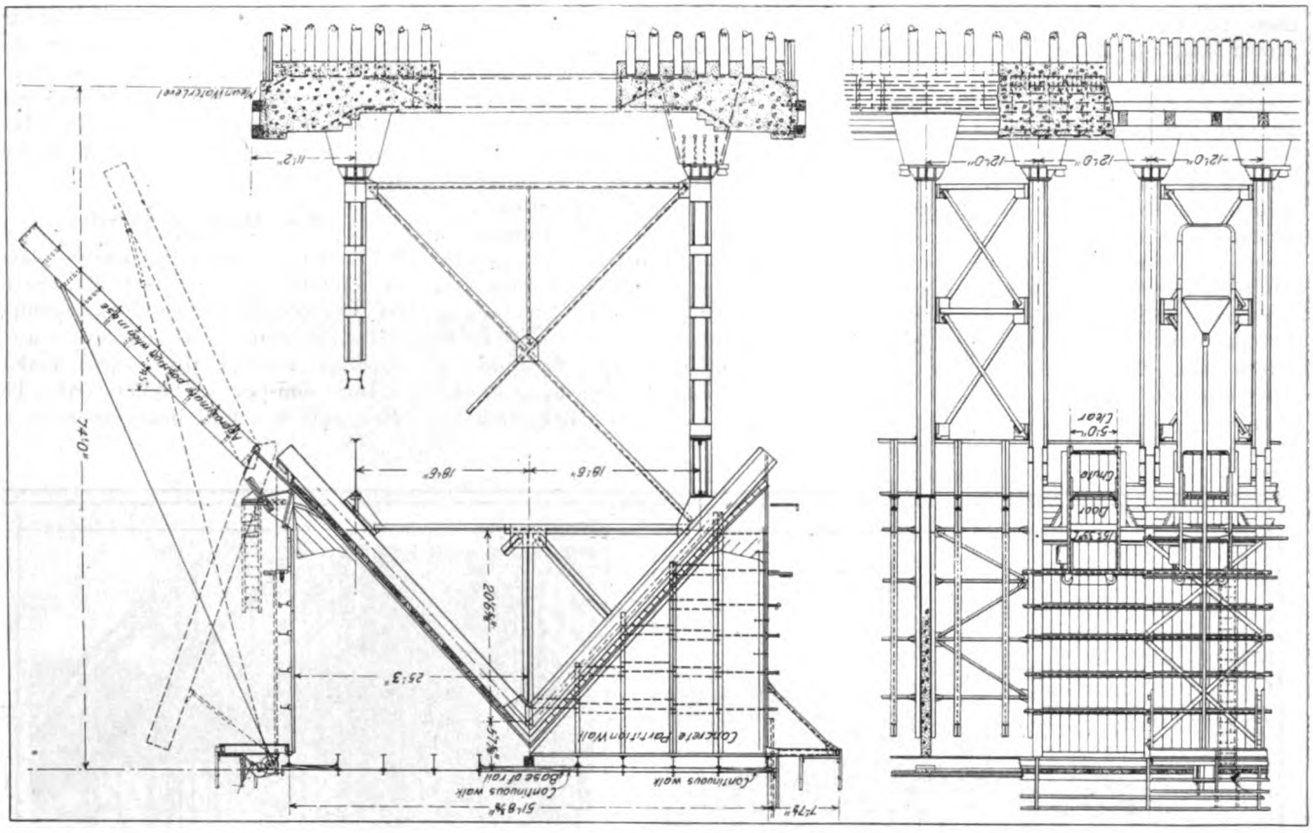

FIG. 2—ELEVATION AND TYPICAL SECTION OF NEW TWO HARBORS DOCK.

The slope of the ore pockets is 47½ degrees. The ends of the bins are made of semi-circular steel plates. This design not only adds to the stiffness of the structure and reduces the amount of steel necessary, since no framing is required to resist the outward pressure of the ore, but also aids greatly in the rapid operation of the dock. The curved surfaces are effective in breaking up the arching of the ore body which frequently occurs and impedes the movement of the material. This design reduces poking to a minimum.

The dock is 1,900 ft. 7½ in. in length from end to end of crib and the distance from the center of the first bent in the dock proper to the final bent at the outer end of the end tower is 1,856 ft. 7½ in. As stated, there are 151 pockets on each side of the dock, spaced 12 ft. centers according to standard practice. From the mean water level of Lake Superior to the base of the rails in the tracks on the top of the dock, the height is 75 ft. and the width of the dock, exclusive of machinery platforms, is 62 ft. 6 in. The structure is, therefore, 1 ft. higher and 10 ft. 10 in. wider than the new Duluth & Iron Range railway dock described in this article. The height from water level to hinge of spout is 40 ft. Six of the largest vessels on the lakes may be loaded at this dock at one time.

The mechanism for hoisting the spouts is similar to that installed on the Duluth & Iron Range dock. The doors are of the usual type, but radical changes have been made in the design of the spouts. They are rectangular in section and tapered. The general nature of the foundation is indicated in Fig. 5. Under each side of the dock rows of piling are driven spaced approximately 2 ft. 5 in. between centers, there being seven piles driven 2½ ft. apart in each row. The two groups of piling are enclosed in two parallel timber cribs, the outside walls of which are sand-tight. At intervals of approximately 28 ft. 9 in. the two parallel cribs are tied together by four 10 x 12-in. timbers,

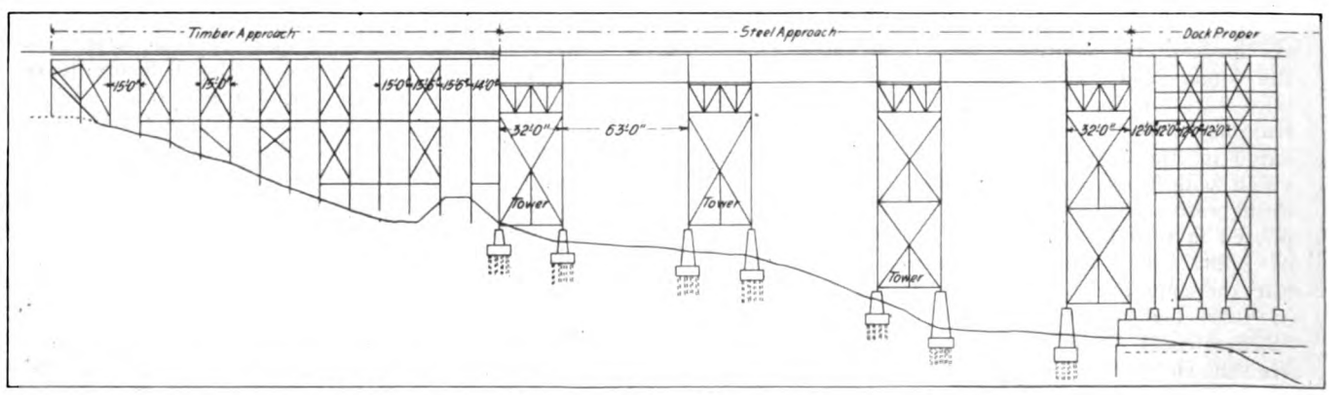

FIG. 3—ELEVATION OF STEEL AND TIMBER APPROACHES OF NEW DOCK AT TWO HARBORS.

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two at the bottom and two at the top of the cribs. The cribs are filled with sand and capped on top by a concrete slab which is 3 ft. thick under the supporting columns or piers. The outer edge of the concrete slab is built-up in the form of a coping as indicated in Fig. 5, and the face of the wall is protected from contact with the ore boats by two 10-in. 30-lb. I-beams set in the cement, as shown in Fig. 5. No wooden fenders are used.

The posts supporting the bins are solid concrete, 7 ft. x 2 ft. 9 in. in cross section. They are 31 ft. 10 in. in height, exclusive of the pedestals, which are 8 ft. 6 in. in height above the water line. The only reinforcing in the posts consists of ⅞-in. vertical rods embedded 4 in. from the surface at the corners. These are merely intended to protect the corners from injury and not to lend stiffness to the column. These concrete supporting columns are in reality piers. They are tied together longitudinally by two sets of reinforced concrete beams, each beam being 2 ft. deep and 1½ ft. thick. The upper row of beams connects the tops of the piers, as shown in Fig. 5, and the lower row is connected at a point 14 ft. 11 in. above the top of the pedestals. The substructure is further stiffened by 16 tower bays, one at each end and one in the middle, the adjacent piers in the towers being connected by a 12-in. concrete wall. The expansion and contraction of the structure is provided for by the insertion of 15 expansion bays equi-distantly spaced.

The bin walls or partitions which connect the two piers in each bent are composed of a series of columns built of plates and Z-bars. There is a column under each track stringer. These columns are connected by three 8-in. plates, as shown in Fig. 5, so that the bin wall becomes a beam extending across the deck from pier to pier and supporting all the loads imposed upon the superstructure. To give a smooth surface to the inside of the pockets, the steel work in the walls is covered by concrete which is flush with the flanges of the Z-bar columns. A series of seven I-beam purlins connects the bin walls and supports the floors of the pockets. The floors consist of a 6-in. creosoted fir-filling layer with a 4-in. hard maple surface laid on the fir. The construction is quite different from previous design. Heretofore ore dock framing has been merely a modification of standard trestle construction, that is, the structure is supported on steel columns suitably tied together by diagonal bracing, these columns being surmounted by stringers or girders which carry the load between the bents, the bin floors being carried by a series of A-frames. The walls between the bins are merely partitions. In this dock the superstructure is supported on a series of concrete piers, properly tied together by rows of concrete struts, the ore bins, tracks, etc., being carried by the partitions between the bins, which in this case act as large transverse beams.

The semi-circular ends of the bins are built of steel plate varying in thickness from ¼ in. at the top to ⅜ in. at the bottom, riveted together in courses exactly like the shell of a horizontal tubular boiler. The semi-circular form, of course, is self-supporting and no posts or bracing are necessary to resist the outward pressure of ore. As stated, this design prevents arching of the ore, the pockets emptying themselves practically clean.

The ore chute doors are of the ordinary sliding type and are not counter-balanced. They are hoisted by means of a hand winch, so geared that a pressure of 35 lb. on the handle is sufficient to hoist the door.

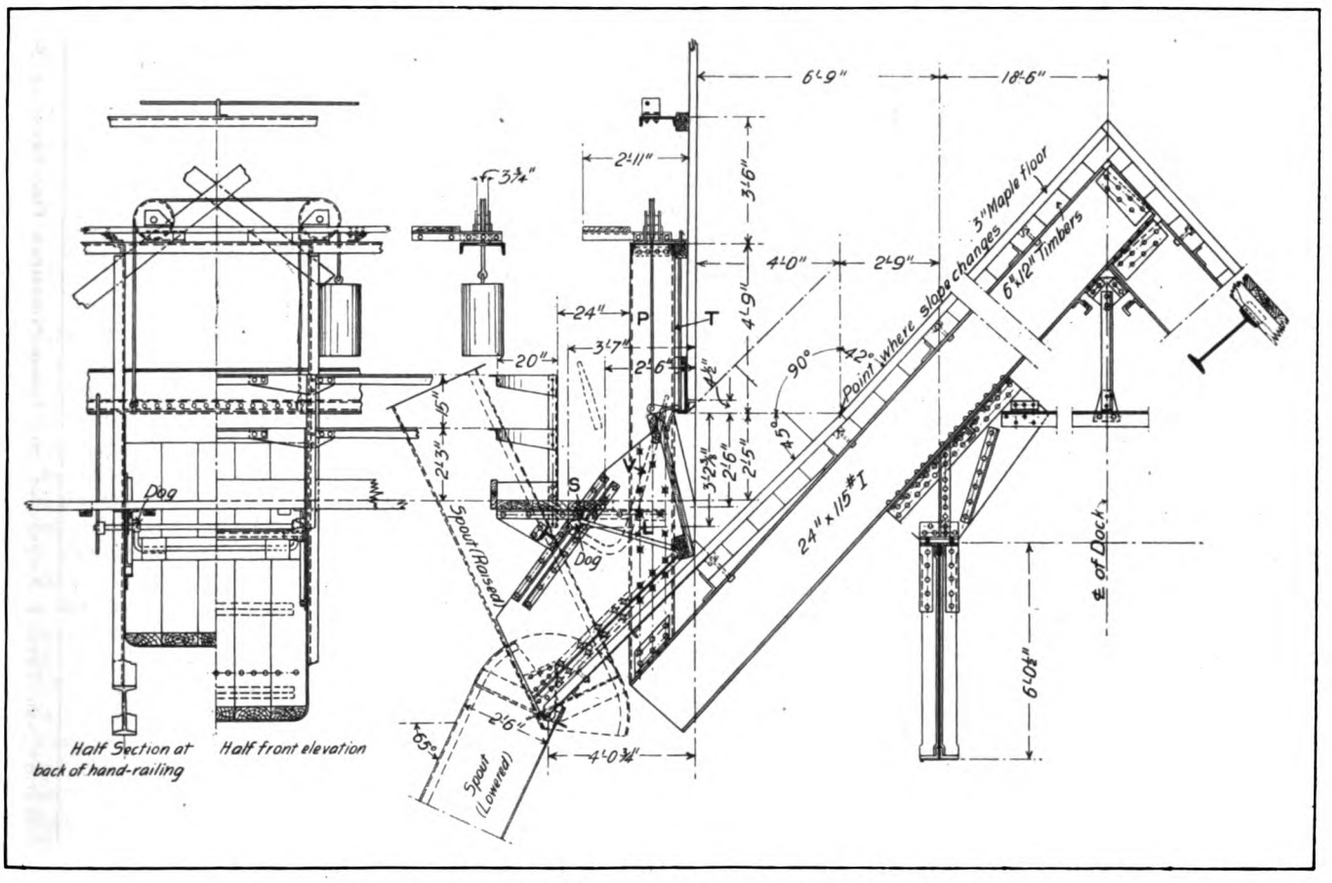

FIG. 4—DETAIL OF ORE CHUTE AND DOOR OF TWO HARBORS DOCK.

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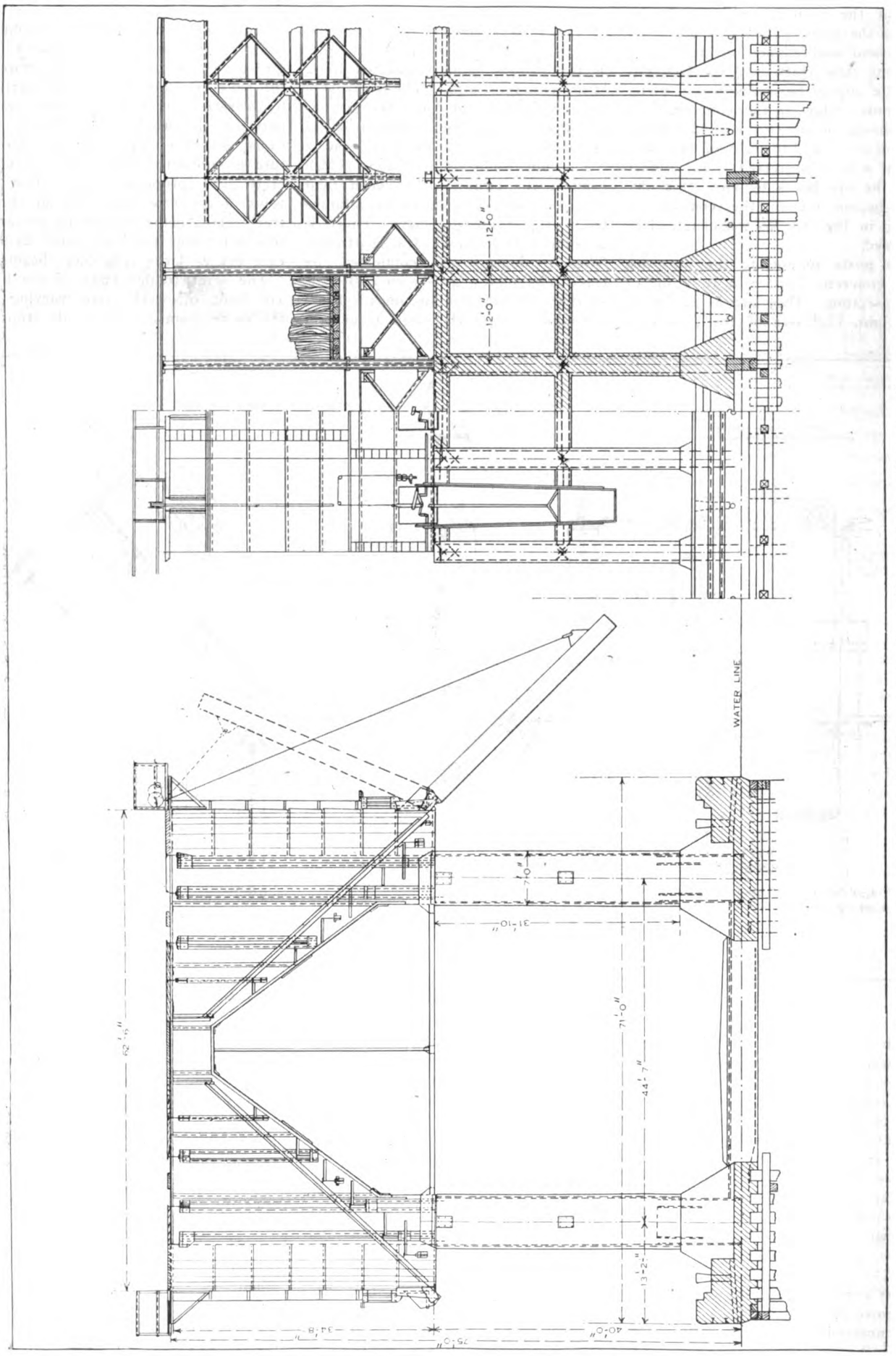

FIG. 5—ELEVATION AND TYPICAL SECTION OF THE GREAT NORTHERN ORE DOCK AT SUPERIOR.

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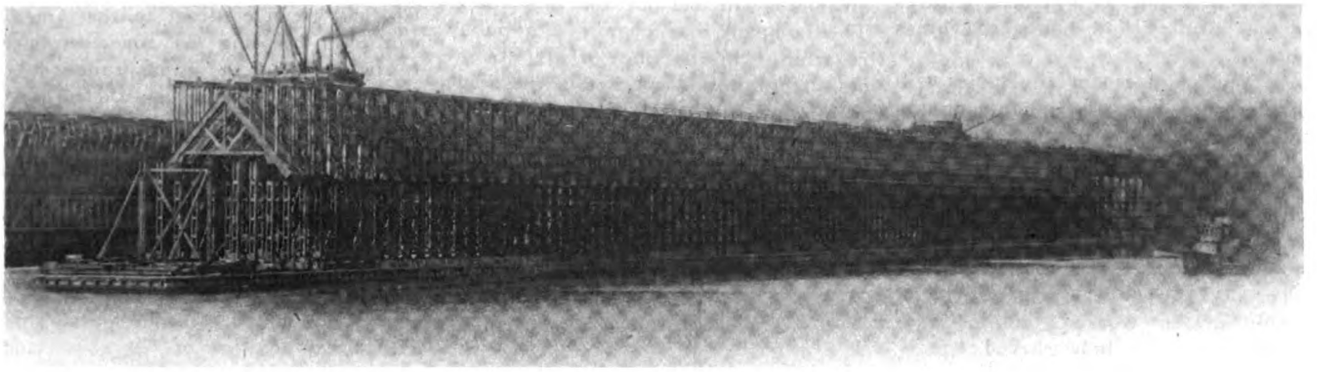
The spouts are operated by electric hoist and are not counter-balanced. This dock has made some marvelous loading records, having loaded a single vessel with 9,500 tons of ore in 25 minutes and eight vessels with an aggregate of 62,000 tons in six hours, or at the rate of 10,334 tons per hour.

The Barnett & Record Co., of Minneapolis, Minn., were contractors for the foundations and concrete work, and Whitney Bros., of Superior, Wis., for the dredging. The steel work was fabricated by the American Bridge Co. and erected by the Pittsburgh Construction Co. The Minneapolis Steel & Machinery Co., Minneapolis, Minn., built the spouts. The dock was designed by Max Toltz, of St. Paul, Minn., consulting engineer. It was erected under his supervision with the co-operation of A. H. Hogeland, chief engineer of the Great Northern railway.



STEEL WORK OF THE TWO HARBORS ORE DOCK

City of Detroit III

HUNDREDS of workmen are busily engaged on the new steamer City of Detroit III, at the Detroit yard of the American Ship Building Co., and present progress indicates that she will be delivered about May 15. Work upon the superstructure is well advanced, so that it is possible to get some idea of the scheme of interior decoration, and in this respect it is quite safe to say that she will not be surpassed by any vessel on the lakes.

The main saloon on the promenade deck is paneled in mahogany veneer of the richest character. Considerable work in bas relief has also been substituted for mural decorations with excellent effect.

When she goes into commission she will be the largest sidewheel passenger steamer in the world, though, of course, this distinction she will not hold very long, as the new sidewheeler for the Cleveland & Buffalo line will exceed her in dimensions.

The City of Detroit III is 470 ft. over all, 455 ft. keel, 55 ft. breadth molded, and 22 ft. depth molded; depth at stem, 29.25 ft.; at stern, 25.25 ft., and at guards 21.25 feet. The hull is built of steel with double bottom divided into 11 compartments by watertight cross bulkheads extending from the keel to the main deck. The bottom is divided at the center line and athwartships into 15 watertight tanks. The main deck, and the housings on the main and orlop decks, are of steel. Her steel skin is carried to the promenade deck with bulwarks of steel.

Her engines will be of the three-cylinder, compound, inclined type, having one high-pressure cylinder 62 in. in diameter, and two low-pressure cylinders, 92 in. in diameter each, with a piston stroke of 102 in. In fact, the design of her engine will be exactly like that of the City of Cleveland II, except that it will be somewhat larger. The Cleveland's engine has proved to be one of the most successful marine installations on the lakes, having after four years of service not been the cause of even a moment's delay. Steam will be supplied from three single-ended and three double-ended boilers, equipped with Howden draft and allowed 160 lb. pressure. The main shaft of the engine is the largest that has ever been cast for use in a steamer on fresh water, weighing about 100 tons. The paddle wheels are of the feathering type, 29 ft. in diameter, fitted with 11 paddle wheels each 14.5 ft. long, and about 5 ft. wide, supported at the outer end by 14-ton steel trusses.

Safety and Convenience.

Practically every device that human ingenuity can suggest for the safety and convenience of the passengers is incorporated in the ship. Probably the thing that will be most appreciated by the traveling public is the fact that running hot and cold water will be found in every stateroom. Modern system of ventilation will renew the air in all parts of the ship where artificial circulation is required. Inside staterooms can depend upon a constant supply of washed fresh air, making them as comfortable and desirable as outside staterooms in the eyes of the management. Altogether there will be 600 staterooms, 25 parlors with baths and private verandas. The automatic fire alarm will reach all parts of the vessel, which will instantly determine the location of a fire should one break out, as the system divides the boat into sections of eight staterooms each, the annunciator showing what section the alarm comes from. This automatic thermostat consists of a small hollow copper wire which is sensitive to heat registering 140 degrees or more. Each stateroom will have telephone connection with the shore while the vessel is at dock.

The parlors will be finished in poplar and hardwood and will contain a chiffonier, settee, thermos bottle for hot and cold water and electric fans. The dining room will be located on the main deck immediately aft of the purser's office, a most commendable innovation, affording abundant light and excellent ventilation. The dining room ordinarily on lake sidewheelers has been below the water line. The dining room will follow the colonial in design and will be finished in mahogany. There will be several private dining rooms in con-

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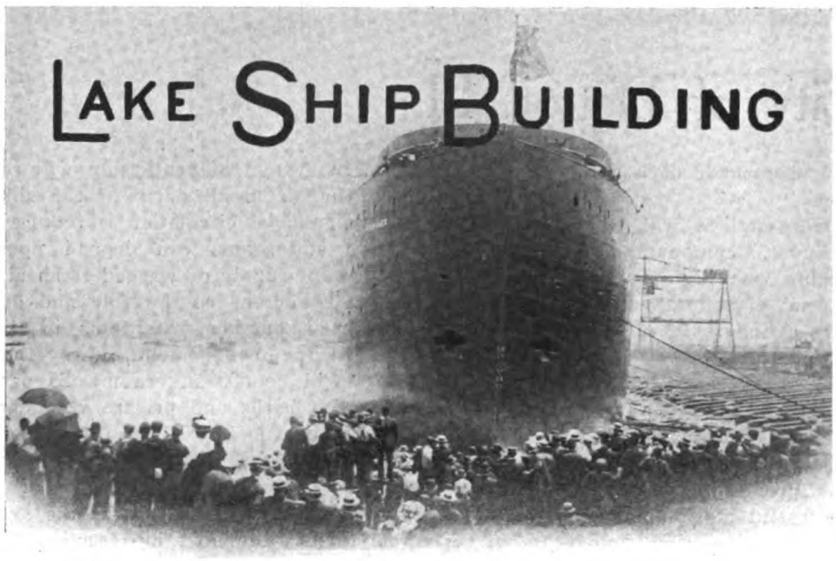
junction with the main dining room.

The buffet will be designed after the plan of an old wine cellar with vaulted ceilings between the columns, the plaster being tooled to represent huge blocks of stone masonry. A striking feature of the room will be paneled oak hogsheads with iron bands above the settees on either side of the room, with electric fixtures in the form of old hammered brass lanterns.

A popular place for the ladies will be the palm court located aft on the upper deck, with pergola and bay window forward and a fountain with running water. A drawing room in Marie Antoinette style will be located on the gallery deck aft, just beneath the palm court. The lounge on the upper deck near the stacks will be of Gothic design worked out in English oak and will include carved capitals, arches, brackets, lanterns and electroliers and a fireplace with electric heat.

The City of Detroit III will go into commission in June next and will operate daily between Detroit and Buffalo, in conjunction with the City of States and Western States will be transferred to the Cleveland-Detroit run, operating daily, though on Saturday and Sunday nights two extra steamers will be put on this route. The company has changed its policy regarding the naming of its steamers. Hereafter it will retain the original names of the steamers, differentiating them by a numeral. It will not be possible for the company to make this uniform, however, as the City of St. Ignace, which was formerly the City of Cleveland, cannot be renamed because she is too old, the law forbidding a steamer's name to be changed after she has reached a certain age.



LAKE ship builders are assured of quite a bit of work during 1912 after all. The Pittsburgh Steamship Co. has given contract to the American Ship Building Co. for the construction of two bulk freighters to be 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep, and to be built on the Isherwood system of construction. The Pittsburgh Steamship Co. is apparently satisfied with the steamer William P. Palmer, which was built upon this system, though it is understood that the new steamers will be strengthened in certain particulars. Both boats will be built at the Lorain yard and will come out late in the summer. Contracts for two canal size boats are also pending.

Within a few weeks the Cleveland & Buffalo Transit Co. will award contract for the construction of a new sidewheel passenger steamer, designed by Frank E. Kirby, to ply between Cleveland and Buffalo. This new steamer will be the largest vessel of her type in the world and steel will enter more largely into her construction than is usual. For instance, her steel structure will be carried to the promenade deck, the orlop, main and promenade decks being entirely of steel. She is to come out in 1913.

The Crosby Transportation Co., of Milwaukee, has also prepared plans for a steamer for Lake Michigan service and it is understood that they will be submitted to the ship builders shortly. The design of this steamer is by W. T. Nevins of Chicago.

The Standard Oil Co. has given contract to the American Ship Building Co. for an oil barge, to be 258 ft. long, 43 ft. beam and 25 ft. deep for service in the Atlantic coast trade. This makes nine vessels that the American Ship Building Co. has contracted to build for the Standard Oil Co. during the past year.

The Pelee Island Sand & Gravel Co. has given contract to the American Ship Building Co. for a steamer to be used in the sand trade to be 166 ft. long, 156 ft. keel, 37 ft. beam and 10 ft. deep, equipped with a compound engine, cylinders 17½ and 38½ in. diameter by 30-in. stroke. She will trade between the islands and Lake Erie ports.

The Pittsburgh Steamship Co. sold three of its smaller vessels last week, the Masaba and Marina passing to Hutchinson & Co., of Cleveland, and the Corona to O'Brien & O'Gorman, of Toronto. It is understood that the Corona will be converted into a conveyor type of boat for the stone and gravel trade, and that it is also intended to reconstruct the Masaba and Marina for a special trade, though particulars are not as yet obtainable.

It is clear that ship builders are going to have a better season than was expected at the opening of the year.

The bulk freighter Wm. P. Snyder Jr., a duplicate of the James M. Schoonmaker, was launched from the Ecorse yard of the Great Lakes Engineering Works on Jan. 27, being christened by Miss Elizabeth Russel, little daughter of John Russel, vice president of the Great Lakes Engineering Works. Work upon the Snyder Jr. is well advanced and she will be ready to go into commission at the opening of navigation. These two steamers, as known, are the largest on the lakes, being 617 ft. over all, 597 ft. keel, 64 ft. beam and 33 ft. deep. They can pass through only one lock at the Sault and will not be able to avail themselves of full carrying capacity until the third lock at the Sault is finished.

The steamer Castalia, formerly known on the lakes as Harvey H. Brown's yacht, is undergoing remodeling at the Cleveland yard of the American Ship Building Co. The Castalia was lengthened 72 ft. in 1905 and she will now get a new steel deck house forward. The old wooden house will be removed. She will be given another hatch forward. Three hatches forward and two hatches aft will be changed to 12-ft. centers, the hold stanchions being removed.

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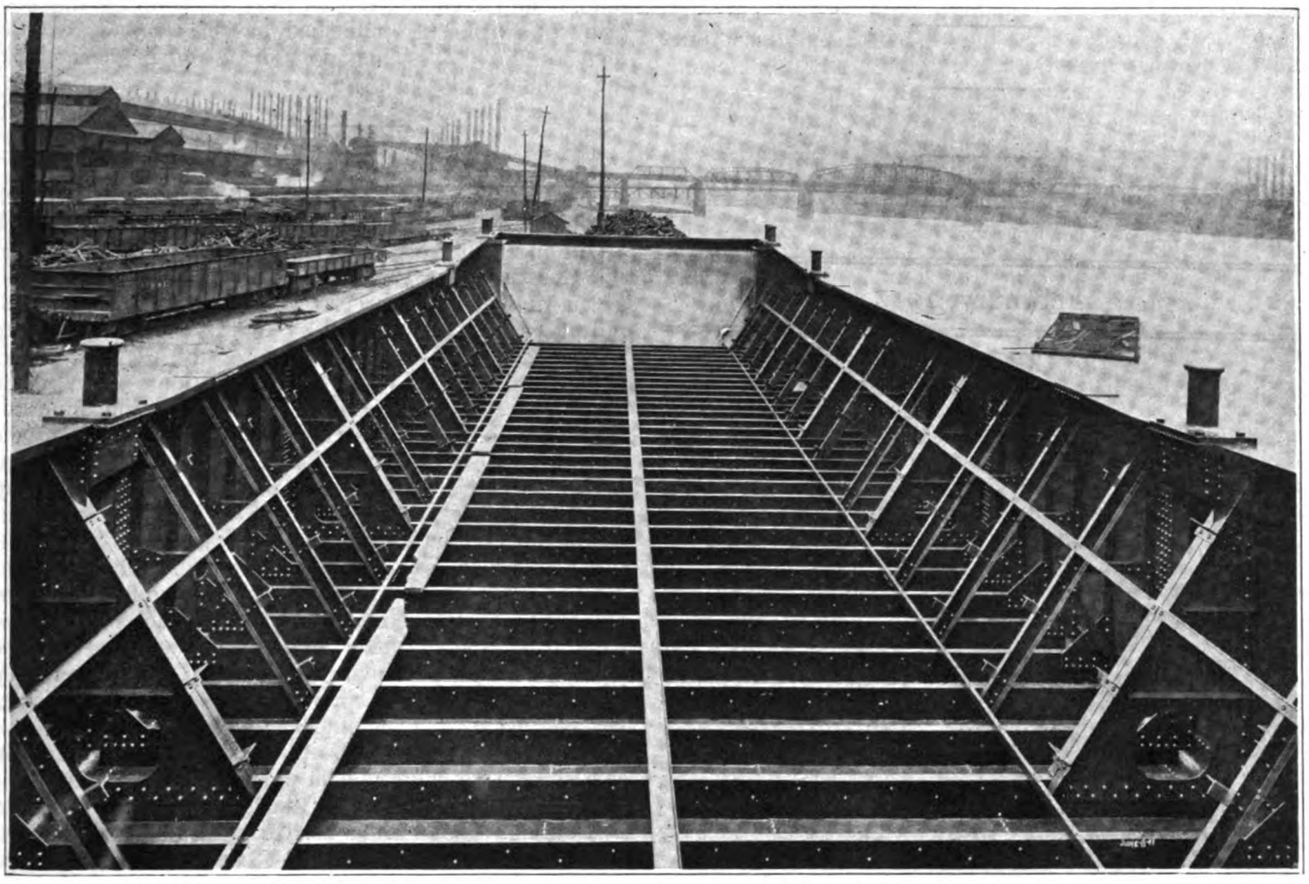
New Type of Steel Barge

The engineering department of the Jones & Laughlin Steel Co., Pittsburgh, Pa., has designed a type of steel barge embodying some new features and has organized a barge building department. The barge illustrated herewith is 200 ft. long, 26 ft. wide and is 10 ft. deep in the ends and 8 ft. 9 in. in the middle. It displaced 260 tons at launching, drawing 11 in. of water. Its carrying capacity is estimated as 1,100 net tons. In the construction of the barge, ¼-in. and 5-in. plates were used. A steel structural frame is provided for the hopper which runs the length of the barge, but the hopper itself is of wood. The barge is floored with 3-in. planks. Later an all-steel hopper may be tried out though the question of wooden or steel sheathing depends somewhat upon the corrosive powers of the coal to be carried. A feature of the design which the builders claim is exclusive in the new type of barge is the curved knuckle at bow and stern which it is believed affords less chance for corrosion or for the opening up of the joint.



STEEL BARGE DESIGNED BY THE JONES & LAUGHLIN STEEL CO.

The Jones & Laughlin Co. has been awarded contract by the Rodgers Sand Co., of Pittsburgh, for two steel barges. These barges will be 130 ft. long, 26 ft. wide and 9 ft. deep, and will have a carrying capacity of 600 tons.

Marine Engineers Beneficial Association

The annual convention of the National Marine Engineers' Beneficial Association was held in Detroit during the week of Jan. 15. President William F. Yates presided. The annual report of the president was a most voluminous document, the better part of two days being devoted to its consideration. The report reviewed the work of the year and showed the association to be in excellent condition both as to membership and finances. Little or no business of a public nature was transacted by the association. Officers were elected as follows: President, Wm. F. Yates, New York; first vice president, David W. Miller, Seattle, Wash.; second vice president, George H. Bowen, Port Huron, Mich.; third vice president, Charles M. Bosburgh, New Orleans; secretary, George A. Grubb, Chicago; treasurer, Albert L. Jones, Detroit.

Advisory board: W. S. Brown, Buffalo; Edwin G. Groff, Philadelphia, and Frank J. Houghton, New York. Trustee, James J. Watters, New York. The only change in the officers of the association is that of David W. Miller of Seattle as first vice president in place of Arthur Hyde, of Cleveland.

The sessions were concluded by a smoker which was given to the engineers at Hotel Tuller by the Supplymen's association. This was a very enjoyable affair, consisting of songs, dancing and monologues by players from the various theaters. The members were of the opinion that they had never had a better time than in Detroit, where the slogan says that life is worth living. The next meeting will be held at Charleston, S. C.

The Metropolitan Steamship Co., the Maine Steamship Co. and the Eastern Steamship Co. have been merged into the Eastern Steamship Corporation. Mr. Calvin Austin, president, has appointed O. H. Taylor passenger traffic manager and George W. Sterling freight traffic manager, with offices at Pier 14, North river, New York. For popular recognition the old names of the lines will be retained, as the Metropolitan Line, the Maine Steamship Line and the Eastern Steamship Line.

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Ore Loading Docks

In this issue are briefly described three new ore loading docks built on Lake Superior. The principle of these docks has not changed from the beginning, though many material improvements have been made. The great departure has been in the use of steel and concrete in place of timber. Up to a few years ago, the supporting structure consisted of a frame timber trestle with wooden bins. The average life of the superstructure of such docks has been about eight years, the cost of maintenance being obviously high and the danger from fire great. The new docks described have eliminated wood as far as possible in their construction. These new docks are quite distinct in design. The new dock at Two Harbors is practically a steel trestle, concrete being used only for foundations and bin partitions. The Great Northern dock at Superior uses concrete entirely for the supporting structure. The new dock at Presque Isle combines steel and concrete in its construction, the steel frame work carrying the load and the concrete protecting the steel. As the modern ship is naturally high out of the water when light, the docks have been made correspondingly higher, in order to afford sufficient pitch to the ore spouts, and as they are constructed of more lasting material than the old docks, the pockets are much larger, affording greater dispatch in loading. Power has also been introduced for operating spouts and doors and as the bin ends are curved instead of square, arching of the ore is not likely to occur. The point aimed at throughout is dispatch.

The Iron Trade Review of Feb. 1 contains the full reply of the Steel Corporation to the government's suit, seeking to dissolve it. Everyone is advised to read it and then to read by way of contrast the government's brief, as published in *The Iron Trade Review* of Nov. 2. Then do a little independent thinking. That's all.

Hawke-Olympic Collision

Not in many years has a collision case, in which a merchant ship was involved, attracted so much attention as that of the White Star Liner Olympic and the British cruiser Hawke. The White Star Line has given notice of appeal from the decision of the admiralty court. Merchant navigators have never been stirred up quite like this before, the British papers being daily filled with communications from them. The great majority of these communications find for the Olympic. It is regrettable that the decision of the admiralty is so long that it cannot well be published in full, because it is an exceedingly fine summing up of the evidence as submitted. The evidence is voluminous and conflicting and the court brought to its sifting a mind of great analytical clarity. In fact, after reading the decision, it is difficult to understand how any other opinion could have been rendered, and it is clear that the decision upholds the finding of the court of inquiry which was held at Portsmouth by the British admiralty immediately after the mishap, because no court martial has followed.

Briefly the court bases its conclusion upon the fact that the vessels were not on parallel courses, but rather on crossing courses, and that the Olympic was the overtaking vessel. It is well to appeal the case, however, that perhaps more practical minds may pass upon it, because the collision was needless and could readily have been avoided. For instance, it could have been avoided by the momentary slowing down of the cruiser, even if under a strict interpretation of the rules she was not required to slow down.

The court accepted the suction theory which, of course, is not surprising to American navigators, especially the pilots of the great lakes, but it appears to be treated with contempt by experienced navigators abroad. The temper of the navigator towards the decision is very well expressed by a communication from a practical man recently published in one of the British papers, in which among other things he says:

As a practical man and an engineer who was a passenger on the Olympic during a previous voyage, who was on deck at or about the same spot in daylight, when another large vessel passed quite close, and who has studied the evidence and the arguments as reported, I should say when I state I am amazed at what I consider the seeming ridiculous decision arrived at by the Court of Admiralty, that I am only conveying what ninety-nine out of every hundred practical-minded men think on the subject.

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The common-sense view of the facts as these have appeared in the press appears to be plain:—In fine weather, in broad daylight, and, in a calm sea, the Olympic (the largest ship in the world), full of valuable lives, was being carefully navigated through the comparatively narrow-channelled Southampton waters, when H. M. Hawke was espied a considerable way off, but apparently coming fast towards the Olympic. The Hawke apparently rapidly came up to or opposite the Olympic, but instead of slowing down or stopping until the Olympic had successfully got round the turn in front of her, the Hawke came careering on and ultimately rammed the Olympic while she was making the turn in the channel which she had to make; and, so far as the man in the street understands, that appears to be the whole story.

When it is borne in mind that the Olympic was engaged on its regular service like an express train with the H. M. mails on board; whereas the Hawke was only out as it were for the day and at play comparatively, and had apparently only to spend a certain number of hours out in speed trials. Surely the Hawke could easily have been stopped or slowed down long before ever she got near the Olympic or until the Olympic had passed the danger zone in front.

The Admiralty Court has decided, however, that it was some mythical "suction" from the Olympic which drew the bow of the Hawke in towards the Olympic; and that the Olympic was by the "law of the sea" the "overtaking" vessel and solely to blame for the collision, because apparently the Olympic, forsooth, seeing the Hawke making for her full tilt, increased her speed for the moment to get away from her charger, and (according to the court) took "too wide a sweep" to get round the corner.

It appears to me that the correspondent "Vortex" in the *Times* has sufficiently knocked on the head the "suction" theory or myth; as, if such a thing was admitted as a practical reality, there ought to be nothing almost but perpetual collisions in such rivers say as the Thames, the Mersey, the Tyne, the Medway, and the Tay.

If ever—in the public interest—there was a case for appeal before a higher or more impartial tribunal, this surely would appear to be that case.

The amusing thing about the Stanley investigation into the organization of the Steel Corporation is that not a single new fact has been developed—not one that has not been public property and well known to the trade for the past ten years.

Settling by Arbitration

Two leading lake shipping companies, M. A. Hanna & Co. and the Cleveland-Cliffs Iron Co., recently set an example which, if followed by all vessel owners, would save both time and money and serve to clear the dockets of the admiralty courts. The steamer Michigan, owned by the Cleveland-Cliffs Iron Co., and the steamer L. C. Hanna, owned by M. A. Hanna & Co., were in collision near the entrance to Duluth harbor last season and both vessels were damaged. Both companies resolved to settle the case by arbitration and selected Harvey D. Goulder as arbitrator. Neither company inquired into the cause of the accident nor the merits of its own case, but left the matter absolutely without bias to the arbitrator. Mr. Goulder virtually tried the case in his own office with his associates as advocates. He rendered his decision according to the facts, holding the Hanna wholly to blame and the decision is satisfactory to both sides. It is evident from the examination of the evidence that both concrete and abstract justice has been attained.

The example set by these two companies has already been followed. The steamer Harvey H. Brown, owned by the Northwestern Transportation Co., of Detroit, and the steamer D. R. Hanna, of the Pioneer Steamship Co., of Cleveland, were in collision in the St. Clair river. C. E. Kremer, of Chicago, was appointed arbitrator with Mr. Goulder as counsel for the Brown Co., and Hermon A. Kelley as counsel for the Hanna. Mr. Kremer has just rendered a decision exonerating the Brown and holding the Hanna wholly to blame.

Isn't this the sensible course to pursue, for do not all parties to the issue get the concentrated wisdom of minds most capable by training to pass upon its merits?

The United States has built the Panama canal with its own money and without the aid of any nation. It should be free to American vessels. That is the least that congress can do for the American ship.

Ship Yard Census

The general summary for private ship yards, as issued by the Bureau of the Census, shows a decline in the industry, as measured with the census for 1904. The number of establishments has increased 23 per cent, capital invested 4 per cent, number of salaried officials and clerks 20 per cent, amount paid in salaries 21 per cent, and miscellaneous expenses 33 per cent. The value of work done, however, during the year has decreased 11 per cent, cost of material 17 per cent, value added by manufacture 7 per cent, average number of wage earners employed during the year 20 per cent, and amount of wages 14 per cent.

There were 1,353 establishments engaged in the industry in 1909, and 1,907 in 1904, an increase of 23 per cent. The capital invested, as reported in 1909, was $126,118,000, a gain of $4,494,000 or 4 per cent over 1904. The average capital per establishment was approximately $93,000 in 1909, and $111,000 in 1904. The value of work done in private yards during the year 1909 was $73,360,000, and $82,769,000 in 1904, a decrease of 11 per cent. The average per establishment was $54,000 in 1909, and $75,000 in 1904. This decrease in value is in part accounted for by the dismantling of the Eastern Shipbuilding Co.'s yard at Connecticut after the completion of the Great Northern liners, Minnesota and Dakota, as well as to the reduction of output which the Pacific coast has suffered owing to labor troubles.

The great American crime is to display foresight in the organization of a big business and to take advantage of natural opportunities for economic production and distribution.

The Importance of Detail

The great railway systems of the United States are all of them emphasizing the importance of economy in small things. For instance, the Rock Island System figures that it uses about 325,000 pencils per year at a cost of about $6,000 or nearly 2 cents per pencil. It is estimated that not more than one-half the pencil is used before it is discarded. The company suggests that if each employe uses another inch of each pencil before he throws it away, the net saving will be about $2,000 per annum. It has even suggested that chief clerks follow the rule laid down for the issuance of tools and that for each pencil issued the stub of the old one should be turned in. The bigger the system is, the more important attention to detail becomes.

The Commission on Economy and Efficiency has recommended the abolition of the United States Revenue Cutter Service. What next?

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SEATTLE, Dec. 30, 1911.—Statistics covering the chartering of foreign colliers by the United States navy department since July 1, 1910, alone form a startling indictment, showing a wanton disregard of this country's coastwise laws, utter contempt for the rights of American ship owners and an unexcusable waste of the public money. The department has been in the habit of chartering six or eight vessels at a time and thus its policy has not attracted the attention it deserves. However, compiled figures show that since July 1, 1910, the department has sent to the Pacific coast with coal from the Atlantic range 47 colliers, while 12 more are to arrive within the next three months. Of these 59 bottoms but nine are American vessels.

A Ruinous Policy.

These startling facts are in the possession of Congressman William E. Humphrey, of this city, who intends at the present session of congress to repeat previous efforts to prevent the department from continuing this policy, so ruinous to American shipowners on this coast and so demoralizing to freight rates on the Pacific. In previous sessions Congressman Humphrey's efforts to pass legislation to prevent this invasion of the coastwise carrying trade of the United States by foreign colliers has been nearly successful and he intends to continue the fight until conditions are changed. United States Senator Wesley L. Jones, of this state, in speaking of the navy department's attitude toward this coast, said only yesterday:

"For years past the senators and representatives in congress from this coast have battled bitterly for recognition of the needs of this section. This fight will be kept up and will be as vigorous and effective as we can make it. The fight has grown so bitter that we from the coast are about ready to vote against any appropriations for the construction of more battleships unless some of these are sent to the ship yards of the Pacific coast."

Hostility to Coast Interests.

Senator Jones was referring to the lack of protection on this coast, but his attitude expresses that of other members of congress from this section who are prepared to vote against more money for the department unless it shows a more friendly disposition to the western shore of this country.

Summarizing what the navy department has done to injure the American commerce of the Pacific in the last 18 months, it may be of interest to state that the 50 foreign colliers sent here during that period have brought approximately 300,000 tons of Atlantic range coal for the Pacific navy yards. At the average rate of $5 per ton, which is a fair figure, the department has expended at least $1,500,000 in freights alone during this time, all of which has gone to enrich the coffers of foreign owners. This means almost 100,000 per month paid to foreign ship owners, which figure in itself is of startling import. Including the American bottoms, fixed for this same business during the past 18 months, consisting of five sailing ships and four steamers, the navy has dumped on this coast approximately 350,000 tons of Atlantic coal for the use of navy vessels in these waters.

Seven of the foreign tramp colliers sent to Honolulu with coal during this period departed for Australia in ballast, but with this exception all of these foreign steamers have been chartered to carry cargo from north Pacific ports. Exclusive of the seven which departed in ballast and the 12 colliers yet to arrive, the other 40 vessels were chartered as follows:

Sugar from Honolulu, four. From north Pacific ports—grain, 12; lumber, 16; merchandise, 8; in addition three of these vessels carried coal from British Columbia to San Francisco before beginning their offshore charters.

Displacing American Bottoms.

In round figures this collier tonnage has already carried from north Pacific ports the following cargoes:

Grain, 75,000 tons; sugar, 20,000 tons; lumber, 50,000,000 ft.; merchandise, 40,000 tons.

The injustice done American owners of tonnage operating in the Pacific is seen by the assertion that the 16 foreign steamers which entered the Pacific lumber-carrying trade and took from this coast approximately 50,000,000 ft. of lumber, diverted just that much business from American bottoms. This huge quantity of cargo represents in round figures as much as 45 American sailing vessels will carry. The three foreign tramps which violated the spirit of the coastwise trade by carrying coal from British Columbia to San Francisco, took from American vessels business formerly enjoyed almost exclusively by United States bottoms. The 12 tramps which carried wheat from North Pacific ports to the United Kingdom entered a field which heretofore has been almost exclusively that of sailing ships, both American and foreign. The foreign sailing vessels, which were thus unable to get grain charters, were forced to seek offshore lumber cargoes at lower rates than American owners could afford to accept with the result that the American bottom was forced to lay up or take unprofitable freights.

The 12 foreign colliers which returned from this coast with approximately 75,000 tons of grain carried as much as 25 sailing ships of ordinary size could handle. Consequently at least 25 foreign windjammers entered the lumber trade, displacing about 35 American bottoms. Were it not for the fact that the coastwise laws are strictly enforced in the merchant marine, the four American vessels which carried sugar from the Hawaiian Islands to the Atlantic coast

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would have been displaced by the foreign tramp.

But the end is not yet. En route or chartered are still two American steamers and ten foreign tramps bringing coal to this coast. These vessels will bring about 65,000 tons of coal and they will carry from this coast an equal amount of freight. The American steamers will probably freight general merchandise to New York, as this trade is still exclusively enjoyed by the stars and stripes, but the ten foreigners will likely be taken for lumber, of which they can take at least 30,000,000 ft., meaning the equal of what 30 ordinary sized American lumber carriers on this coast would freight.

Freight Rates Active.

During 1911 freight rates on the Pacific, especially for lumber, have been active and fairly high. They show considerable advance over what was offering a year ago. However, this condition is not due to the navy department's policy. It is the natural result of demand and supply. Following several years of ruinous depression in freights, foreign owners gave the north Pacific a wide berth. Rates advanced gradually until now they are on a basis allowing American owners a fair margin of profit. But already there are signs of a return of depression. Rates are beginning to weaken and within two or three months they are likely to take a drop, especially with so much foreign tonnage headed this way with navy coal. The situation is anything but encouraging to American owners, who have enjoyed a few months of living rates after years of poverty only to see them about to disappear, due largely to the policy of the navy department.

These foreign steamers are cheaply manned and officered. The white officers receive less than 50 per cent of the wages paid American officers. They are manned by Chinese and Lascar crews, the cheapest kind of labor, although Norwegian vessels are manned by seamen of that nationality who are paid but a small fraction of what Americans get.

The table accompanying is a summary of the American and foreign coal tonnage, engaged by the navy department since July 1, 1910, to bring fuel to this coast, including that arrived and that yet en route.

ARRIVED.

	STEAM. Am.	Net tons.	For.	Net tons.	SAIL. Am.	Net tons.	For.	Total tonnage arrived.
Puget Sound	—	——	9	25,070	—	——	—	25,070
San Francisco	2	7,705	22	67,216	4	11,746	—	86,667
Honolulu	—	——	9	26,042	1	2,715	—	28,757
	2	7,705	40	118,328	5	14,461		140,494

TO ARRIVE.

	STEAM. Am.	Net tons.	For.	Net tons.	Total to arrive.	Total chartered.
Puget Sound	—	——	2	6,172	6,172	31,242
San Francisco	2	5,092	8	22,616	27,708	114,375
Honolulu	—	——	—	——	——	28,757
	2	5,092	10	28,788	33,880	174,374

List of Foreign Colliers Chartered.

Following is a list of the colliers chartered by the navy department since July 1, 1910, together with rig and nationality of each vessel, net tonnage, where navy coal was discharged, and disposition of vessel after completing charter to the navy department:

Puget Sound, July 1, 1910, to Jan. 1, 1911.

Towergate, Br. str., 2,358 tons, lumber, Buenos Ayres via Portland.

Christian Bors, Nor. str., 2,788 tons, grain, U. K. via Puget Sound.

Bjornstjerne Bjornson, Nor. str., 3,280 tons, grain, U. K. via Portland.

Uganda, Br. str., 2,783 tons, grain, U. K. via Portland.

Puget Sound—1911.

Netherpark, Br. str., 2,804 tons, lumber, Australia via Puget Sound.

Dunbar, Br. str., 2,357 tons, coal, San Francisco via British Columbia.

Merchandise, Orient via Puget Sound.

Harpalion, Br. str., 3,669 tons, wheat, U. K. via Puget Sound.

Harlesden, Br. str., 2,724 tons, merchandise, Orient via Puget Sound.

Silver Birch, Br. str., 2,307 tons, merchandise, Orient, by Puget Sound.

Puget Sound—To Arrive.

Hartington, Br. str., 2,500 tons, 48 days out on Dec. 20.

Harpagus, Br. str., 3,672 tons, 13 days out on Dec. 20.

San Francisco—Arrived Since July 1, 1910.

Manhattan, Br. str., 7,705 tons (arrived at San Francisco June 17, 1910), coal for San Francisco via Nanaimo, B. C.; mdse. for U. K. via Puget Sound and San Francisco.

Strathfillan, Br. str., 2,816 tons, chartered on time by Portland-Asiatic Steamship Co.

Lewis Luckenbach, Am. str., 2,574 tons; merchandise, New York via Puget Sound and San Francisco.

Acme, Am. ship, 2,987 tons; lumber, New York via Tacoma.

William P. Frye, Am. ship, 2,998 tons; sugar, Philadelphia via Honolulu.

Edward Sewall, Am. ship, 2,916 tons; sugar, Philadelphia via Honolulu.

Strathbeg, Br. str., 2,808 tons; barley, Dublin via San Francisco.

Dirigo, Am. ship, 2,845 tons; merchandise, New York via San Francisco.

Courtfield, Br. str., 2,874 tons; lumber, Sydney via Puget Sound.

Hampton, Br. str., 2,808 tons; lumber, Sydney via Puget Sound.

Massachusetts, Am. str., 5,131 tons; sugar, Philadelphia via Honolulu.

Bjornstjerne Bjornson, Nor. str., 3,280 tons; lumber, Australia via Eureka and Puget Sound, time charter.

Arna, Br. str., 3,249 tons; barley, U. K. via San Francisco.

Harpeake, Br. str., 2,840 tons; lumber, Melbourne via Puget Sound.

Wakefield, Br. str., 2,535 tons; lumber, Freemantle via Columbia river.

Collingham, Br. str., 2,540 tons; wheat, U. K. via Columbia river.

Admiral Borrensen, Nor. str., 2,625 tons; coal, San Francisco via British Columbia; lumber, Australia via Eureka and Puget Sound.

Christian Bors, Nor. str., 2,788 tons; lumber, Australia via Eureka and Puget Sound.

Strathavon, Br. str., 2,830 tons; lumber, Sydney via Puget Sound, time charter.

Heliopolis, Br. str., 2,967 tons; grain, U. K. via Columbia river.

Fitzclarence, Br. str., 2,832 tons; lumber, Adelaide via Puget Sound, time charter.

Strathdene, Br. str., 2,790 tons; merchandise, Salina Cruz via British Columbia, time charter.

Strathspey, Br. str., 2,852 tons; lumber, Australia via Columbia river, time charter.

Strathness, Br. str., 2,819 tons; grain, U. K. via Columbia river.

Guernsey, Nor. str., 2,808 tons; lumber, Adelaide via Portland, time charter.

Strathnairn, Br. str., 2,812 tons; lumber, Calcutta via Puget Sound.

Fitzpatrick, Br. str., 2,838 tons; grain, U. K. via Portland.

Strathhalbyn, Br. str., 2,804 tons; lumber, Australia via Puget Sound, time charter.

San Francisco—To Arrive.

Nero, U. S. collier, 1,900 tons, 60 days out on Dec. 20.

Strathhairly, Br. str., 2,783 tons, 29 days out on Dec. 20.

Strathhendrick, Br. str., 2,843 tons, 51 days out on Dec. 20.

Strathgyle, Br. str., 2,837 tons, not sailed on Dec. 16.—Jan. 1-20, loading.

Strathleven, Br. str., 2,845 tons, not sailed on Dec. 16.—Jan. 5-25, loading.

Strathtay, Br. str., 2,850 tons, not sailed on Dec. 16.—Jan. 10-31, loading.

Strathness, Br. str., 2,819 tons, not sailed on Dec. 16.—Jan. 15-Feb. 15, loading.

Strathbeg, Br. str., 2,808 tons, not sailed on Dec. 16.—Jan. 20-Feb. 20, loading.

Strathallan, Br. str., 2,831 tons, not sailed on Dec. 16.—Feb. 10-29, loading.

J. L. Luckenbach, Am. str., 3,192 tons, not sailed on Dec. 16.—Nov.-Jan., loading.

Honolulu—1910 (None chartered 1911).

Damara, Br. str., 3,219 tons; grain, U. K. via San Francisco; this vessel was wrecked upon leaving San Francisco in October, 1910, but was later salved and repaired and since has been used in the north Pacific trade, still under British registry.

Masunda, Br. str., 3,198 tons; grain, U. K. via Columbia river.

Erskine M. Phelps, Am. ship, 2,715 tons; sugar, Philadelphia via Honolulu.

Selsdon, Br. str., 2,541 tons; sailed for Australia in ballast.

Kilchattan, Br. str., 2,418 tons; sailed for Australia in ballast.

Romera, Br. str., 3,189 tons; sailed for Australia in ballast.

Katherine Park, Br. str., 3,042 tons; sailed for Australia in ballast.

Volney, Br. str., 2,928 tons; sailed for Australia in ballast.

Collingham, Br. str., 2,540 tons; sailed for Ocean Island in ballast.

Heliopolis, Br. str., 2,967 tons; sailed for Australia in ballast.

Battleship Awards

The navy department has awarded contract for the construction of the two 27,000-ton battleships Oklahoma and Nevada, authorized at the last session of congress, to the New York Ship Building Co., Camden, N. J., and the Fore River Ship Building Co., Quincy, Mass., respectively. The New York Ship Building Co.'s bid was $5,926,000 and that of the Fore River Company $5,935,000. The former will build a vessel of the reciprocating type and the latter company will install Curtis turbine engines. These two yards have now on hand a very fine program of construction assuring steady employment for a long time.

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Building Bulk Freighters

THE building of bulk freighters on the great lakes has been a considerable industry during the past decade. When the figures are analyzed it will probably surprise everyone that the greater portion of this building has been for independent interests. In fact from the beginning of 1902 to the close of 1911, inclusive, vessels aggregating 1,213,100 tons carrying capacity on a single trip have been built for independent interests as against 786,400 gross tons carrying capacity for interests that have their own mines and furnaces.

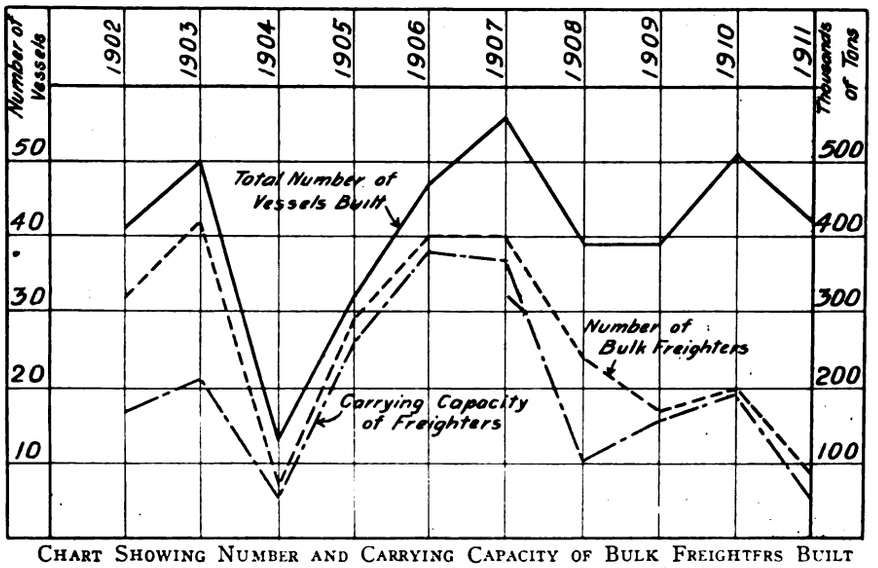

CHART SHOWING NUMBER AND CARRYING CAPACITY OF BULK FREIGHTERS BUILT SINCE 1902

The real beginning of construction for the so-called shipping interests was after the launching of the Augustus B. Wolvin, in 1904. During the years 1902, 1903 and 1904 only two vessels of 11,000 gross tons carrying capacity were constructed for shipping interests, while vessels aggregating 410,650 gross tons carrying capacity were built for independent interests. From Jan. 1, 1905, until the close of 1911, vessels aggregating 775,400 gross tons carrying capacity have been built for shipping interests, and vessels aggregating 802,450 tons carrying capacity have been constructed for independent interests.

It is quite interesting to follow the relative percentages of the tonnages of shippers and independents during the succeeding years. The independents led during 1905 with a gross carrying capacity of 147,900, as against 111,300 for the shippers. The independents maintained their lead throughout 1906, building 211,500 tons, as against 167,500 tons for shipping interests. It was not until 1907 that the tonnage built for the shippers exceeded that built for independents. The figures for that year are 197,500 for the shippers and 160,100 for the independents. The year 1908, following the severe financial panic of 1907, is marked with caution on behalf of the shippers. They only built tonnage aggregating 47,800 tons, as against 148,600 for the independent interests. In 1909 shippers, however, took the lead with 84,800 tons, as against 44,300 tons for the independents.

By this time the influence of the tonnage controlled by the shippers had become distinctly marked. The year 1908 had seen a drastic reduction in the ore movement, so that the shippers were enabled to handle a very large portion of their own requirements. During 1909, the ore movement was restored to normal and as the season opened late and was accompanied with many unforseen delays, the independents were enabled to keep their vessels reasonably busy, though not all of them had continuous employment. During 1910, shippers constructed vessels of 133,400 tons carrying capacity, as against 58,000 tons for the independents. By

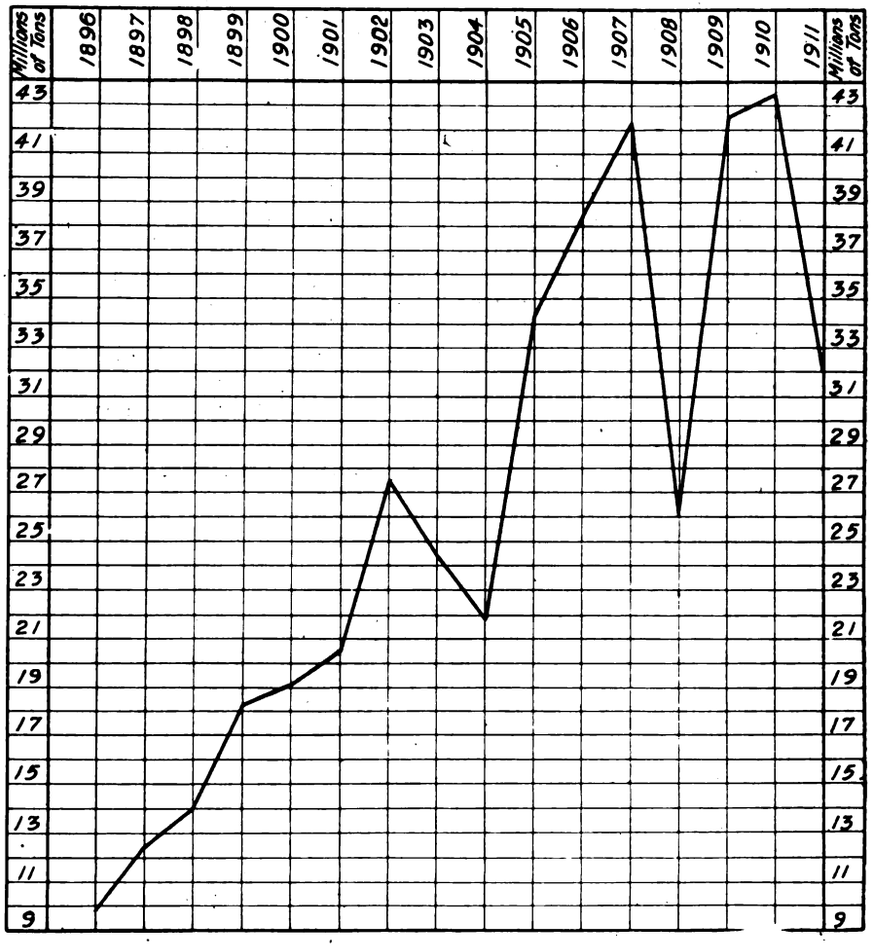

CHART OF IRON ORE MOVEMENT ON THE LAKES SINCE 1896

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this time it had become quite clear that tonnage had been overbuilt and all construction since 1910 has been for shipping interests exclusively. During 1911 the shippers built vessels of 55,000 tons capacity, while the independents built none, nor are there any vessels on the stocks on behalf of the independents for 1912 delivery, though four are under order or under construction for shipping interests.

It should be added that the marvelous increase in loading and unloading efficiency during the past three years has been in a fair measure responsible for the apparent surplus of ships, or what is the same thing, the inability of the independent fleet to find full employment. Their efficiency has become so marked that ships are spending very little time in port and are, therefore, enabled to make a greater number of round trips. This circummstance obviously works to the advantage of the shipper.

Below will be found a list of bulk freighters constructed on the great lakes since 1902. It will be noted that prior to the appearance of the Wolvin in this list all of the vessels are in the 300 and 400-ft. class. Since the construction of the Wolvin only one vessel less than 400 ft. in length, the R. W. England, has been constructed on the great lakes for the bulk freight trade, except, of course, the canalers, while 38 vessels of the 400 ft. and over, 105 vessels of the 500 ft. and over, and 25 vessels of the 600 ft. and over class, have been built.

Bulk Freighters Built Since 1902.

Name.	Length overall, feet.	Carrying capacity, gross tons.
A. G. Brower	366	4,800
G. J. Grammer	366	4,800
E. M. Saunders	400	5,500
W. H. Gratwick	436	6,200
W. W. Brown	366	4,800
H. S. Wilkinson	390	5,000
James Gayley	436	6,200
Bransford	436	6,200
Etruria	434	6,200
Sonora	366	4 800
Sultana	366	4,800
C. W. Watson	400	5,500
F. W. Hart	400	5,500
Wm. Nottingham	400	5,500
A. E. Stewart	376	5,000
Luzon	366	4,800
Steel King	400	5,500
Wm. F. Fitch	366	4,800
W. C. Richardson	374	4,900
L. C. Smith	434	6,200
J. M. Jenks	434	6,200
Harold B. Nye	400	5,500
Panay	366	4,800
James H. Hoyt	376	5,000
Frank H. Goodyear	436	6,200
Moses Taylor	436	6,200
George B. Leonard	400	5,500
H. B. Hawgood	434	6,200
John B. Cowle	440	6 500
Charles Beattie	220	2,000
Thomas Adams	376	5,000
James S. Keefe	255	2,800
W. H. Mack	374	4,900
Hurlburt W. Smith	434	6,200
Sinaloa	436	6,200
Robert Wallace	255	2,800
Anna C. Minch	400	5,500
Mcnroe C. Smith	400	5,500
C. M. Warner	390	5,250
John Lambert	255	2,800
B. Lyman Smith	400	5,500
D. G. Kerr	468	6,900
Saxona	436	6,200
John Sharples	255	2,800
Wilbert L. Smith	400	5,500
John Crerar	255	2,800
Albert M. Marshall	255	2,800
H. G. Dalton	255	2 800
D. M. Clemson	468	6,900
Louis Woodruff	436	6,200
A. D. Davison	255	2,800
George C. Howe	255	2,800
S. N. Parent	255	2,800
James H. Reid	468	6,900
G. Watson French	376	5,000
Sonoma	436	6,200
F. W. Gilchrist	436	6,200
J. L. Weeks	436	6,200
R. L. Ireland	436	6,200
R. E. Schuck	436	6,200
P. P. Miller	375	4,900
Western Star	435	6,200
Perry G. Walker	436	6,200
J. C. Gilchrist	436	6,200
Henry S. Sill	436	6,200
Wisconsin	434	6,200
Edwin F. Holmes	434	6 200
F. B. Squire	430	6,200
Winnebago	234	2,100
John O. Howard	241	2,500
George L. Craig	404	5,600
Kensington	380	5,000
Umbria	440	6.500
Francis Widlar	436	6,200
Augustus B. Wolvin	560	10,000
Sahara	494	8,000
Martin Mullen	436	6,200
Ball Brothers	500	8,000
R. W. England	376	5,000
Francis L. Robbins	400	5,500
James C. Wallace	552	10,000
Philip Minch	500	8,000
Sylvania	524	9,000
Amasa Stone	545	10,000
L. C. Hanna	524	9,000
E. H. Gary	569	10,500
S. M. Clement	500	8 000
Scapa	524	9,000
Lyman C. Smith	545	10,000
W. E. Corey	569	10,500
W. A. Paine	500	8,000
W. A. Rogers	545	10,000
Powell Stackhouse	524	9,000
H. C. Frick	569	10,500
John Stanton	524	9,000
Joseph G. Butler Jr.	545	10,000
Pendennis White	436	6,200
W. K. Bixby	500	8,000
James B. Wood	534	9,500
James E. Davidson	524	9,000
George H. Russel	484	7,600
Hoover and Mason	524	9,000
Peter White	524	9,000
Frank J. Hecker	484	7,600
W. G. Mather	531	9,300
Frank C. Ball	550	10,000
B. F. Jones	550	10 000
James P. Walsh	500	8,000
Joseph Sellwood	545	10,000
E. D. Carter	524	9,000
Charles S. Hebard	524	9,000
Loftus Cuddy	545	10,000
Abraham Stearn	545	10,000
David Z. Norton	500	8,000
John Sherwin	534	9,500
Harry Coulby	569	10,500
Harvey D. Goulder	545	10,000
J. Pierpont Morgan	600	12,000
Henry B. Smith	545	10,000
Sir Thomas Shaughnessy	500	8,000
E. J. Earling	545	10,000
Charles Weston	569	10,500
Henry H. Rogers	600	12,000
Wm. G. Pollock	440	6,500
J. Q. Riddle	552	10,000
Joshua Rhoades	440	6,500
A. Y. Townsend	602	12,000
Norman B. Ream	600	12,000
Henry A. Hawgood	552	10,000
Wm. E. Fitzgerald	440	6,500
D. R. Hanna	552	10,000
Peter A. B. Widener	600	12,000
James S. Dunham	440	6,500
D. J. Morrell	602	12,000
Samuel Mather	550	10,000
Sheldon Parks	552	10,000
James F. Morrow	440	6,500
Gen. Garretson	540	10,000
W. B. Kerr	605	12,000
William P. Snyder	550	10,000
James Laughlin	550	10,000
Michigan	550	10,000
Ishpeming	550	10 000
E. L. Wallace	445	6,700
J. H. Sheadle	550	10,000
John Mitchell	440	6,500
Eugene Zimmerman	500	8,000
Sierra	458	6,800
Mathew Andrews	552	10,000
Hugh Kennedy	552	10,000
J. H. Bartow	524	9,000
Thomas Lynch	600	12,000
H. P. McIntosh	540	10,000
Henry Phipps	600	12,000
Leland S DeGraff	605	12,000
George F. Baker	600	12,000
Charles O. Jenkins	524	9,000
Hemlock	440	6,500
Wm. M. Mills	605	12,000
Jay C. Morse	552	10,000
Odonah	440	6,500
Calumet	440	6 500
Cyprus	440	6,500
Salt Lake City	552	10,000
Crete	440	6,500
Ward Ames	552	10,000
J. J. Sullivan	552	10,000
Edwin N. Ohl	440	6,500
Arthur H. Hawgood	569	10,500
Verona	440	6,500
Wm. A. Hawgood	552	10,000
Adriatic	440	6,500
H. P. Bope	552	10,000
Elba	440	6,500
Charles W. Kotcher	440	6,500
Thomas Barlum	500	8,000
Caldera	524	9,000
Thomas F. Cole	605	12,000
D. O. Mills	552	10,000
Wm. B. Davock	440	6,500
Wilpen	574	11 000
Milinokett	524	9,000
John J. Boland	500	8,000
Josiah G. Munro	552	10,000
Jacob T. Kopp	500	8,000
Charles Hubbard	460	6,800
Smith Thompson	458	6,800
John Dunn Jr.	524	9,000
B. F. Berry	569	10,500
Wainwright	440	6,500
J. J. H. Brown	452	6,700
John A. McGean	440	6,500
J. E. Upson	524	9,000
Wm. H. Truesdale	452	6,700
A. W. Thompson	524	9,000
A. E. Nettleton	545	10,000
William H. Wolff	524	9,000
Rufus P. Ranney	440	6,500
Howard M. Hanna Jr.	500	8,000
John A. Donaldson	400	5 500
W. R. Woodford	552	10,000
Price McKinney	452	6,700
J. F. Dursten	452	6,700
Honduras	256	2,800
Normania	440	6,500
M. A. Bradley	480	7,500
Harry A. Berwind	557	10,000
William Livingstone	557	10,000
Adam E. Cornelius	440	6,500
James Corrigan	550	10,000
Daniel B. Meacham	550	10,000
Theodore H. Wickwire	464	6,800
Fred G. Hartwell	524	9,000
Alva C. Dinkey	600	12,000
Eugene J. Buffington	600	12,000
Alfena	374	5,000
La Belle	524	9,000
Andrew S. Upson	400	5,500
John J. Barlum	524	9 000
Benjamin Noble	256	2,800
Isaac M. Scott	524	9,000
G. A. Tomlinson	524	9,000
J. S. Ashley	524	9,000
Wm. B. Schiller	600	12,000
John P. Morgan Jr.	600	12,000
A. A. Augustus	524	9,000
Clifford F. Moll	464	6,800
Shenango	607	12,000
Denmark	460	6,700
Leonard B. Miller	524	9,000
John P. Reiss	524	9,000
John B. Cowle	545	10,000
Charles L. Hutchinson	524	9,000
Joseph Wood	524	9,000
A. M. Byers	524	9,000
Peter Reiss	524	9,000
Charles S. Price	524	9,000
E. H. Utley	524	9 000
W. C. Moreland	600	12,000
Ontario	465	6,800
Champlain	465	6,800
Harry E. Yates	550	10,000
St. Clair	465	6,800
Theo. H. Wickwire Jr.	550	10,000
W. J. Olcott	605	12,000
Wm. B. Dickson	605	12,000
Wm. P. Palmer	600	12,000
Willis L. King	600	12,000
Norway	524	9,000
Wm. C. Agnew	552	10,000
Thomas Walters	600	12,000
Quincy A. Shaw	524	9,000
The Harvester	545	10,000
Col. J. M. Schoonmaker	617	14,000
W. J. Snyder Jr.	617	14,000

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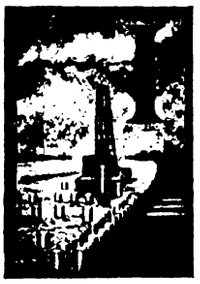
Notes on Pile Protection

By T. Howard Barnes, *



IN THE course of some wharf construction for the Guatemala Railway Co. in Puerto Barrios, Guatemala, it became necessary to deal with some creosoted southern United States piles which had been in place for about 17 years. These piles were nearly all of them in fair condition excepting at and near the water line, but at this belt for, say, 5 ft. in width, most of them were badly eaten, many having cavities extending completely through them, the result of the combined activity of the teredo and the limnoria. The expense of replacing these piles with new ones would approximate $50 each. The incentive for saving them by placing some reinforcement was so great that the writer gave much time to its consideration.

Saving the Piling.

The first idea was to place such reinforcement by using a chamber clamshell like, each half of which should have a semi-circular opening in the parting line of the bottom for embracing the pile when clamped about it, and which would admit a workman after unwatering the chamber, the annular space about the pile being first calked. A test chamber was made, but trials in controlling it against the effect of even a wind-chopped sea of moderate force proved the futility of rapid and economical manipulation, and the idea of working in the dry was abandoned. Had the apparatus proved successful it was proposed to place a reinforcement of nails, poultry netting and cement mortar, similar to that hereinafter described for protecting some of the piles which were placed in the new construction.

Accordingly, forms were prepared for placing in the wet about the old piles a reinforced cement-mortar envelope which should have a width of about 8 ft. and a minimum thickness of 2 in. These forms were made of No. 26 gage galvanized iron shaped into cylindrical shape with a slight taper and 10 ft. in length. A 2-in. by 3-in. strip of pine having a length of 8 in. greater than the form was attached on each side of the parting line, which was up and down. The metal was folded about the strip an inch on to the three-inch side, leaving two inches for attaching an oakum strand, which was needed to prevent egress of mortar. Two 2-in. by 4-in. stiffeners of same length as the facing strips were fastened to the form at the one-third point as shown in the cut, Fig. 1. A collar of 2-in. stock made from narrow blocks was provided at the foot to serve as a gage for regulating the thickness of the mortar, as well as serving to calk against in closing the foot against the escape of the mortar.

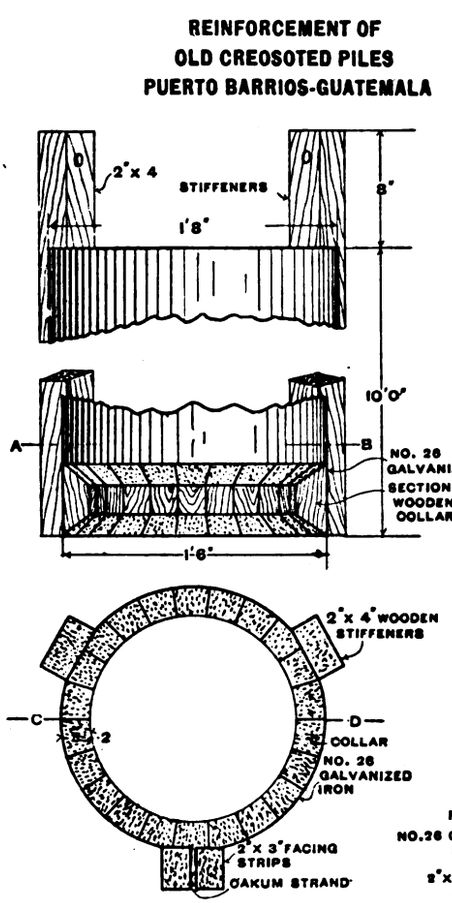


Fig. 1

The mortar envelope was reinforced by a wrapping of poultry fencing of No. 16 gage with 1½-in. mesh. The procedure was first to scrape off the mussel growth on the pile to be treated. This growth forms a complete mat, but is detached quite readily. The poultry fencing is then put in place. This is made up into a roll, 8 ft. long, and having enough fullness to lap on to itself several inches when placed about the pile. The form, nearly buoyant with the stiffeners, is then floated into place, first having been provided with a wreath of fluffy oakum affixed to the collar. The facing strips are closed tightly with carriage clamps hung from them by cords of such length that when the clamps are squared into horizontal position they are in the proper place for screwing up by the divers. The divers are naked, and their further duties are to

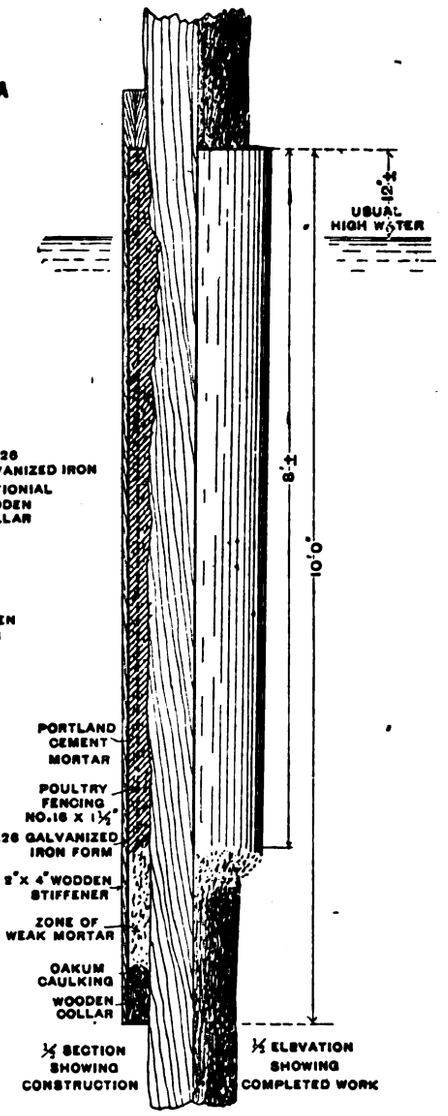


Fig. 2

*From a paper read before the Boston Society of Civil Engineers.

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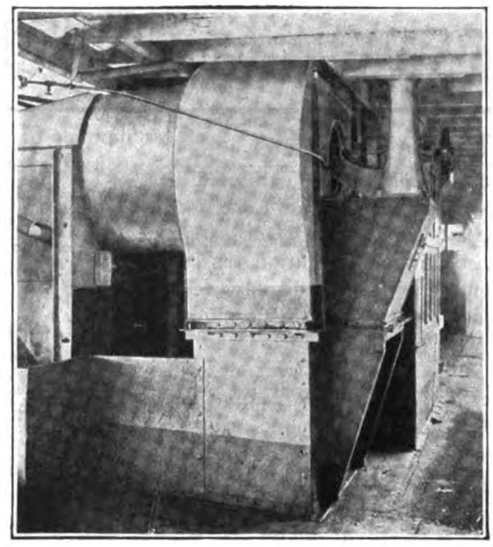

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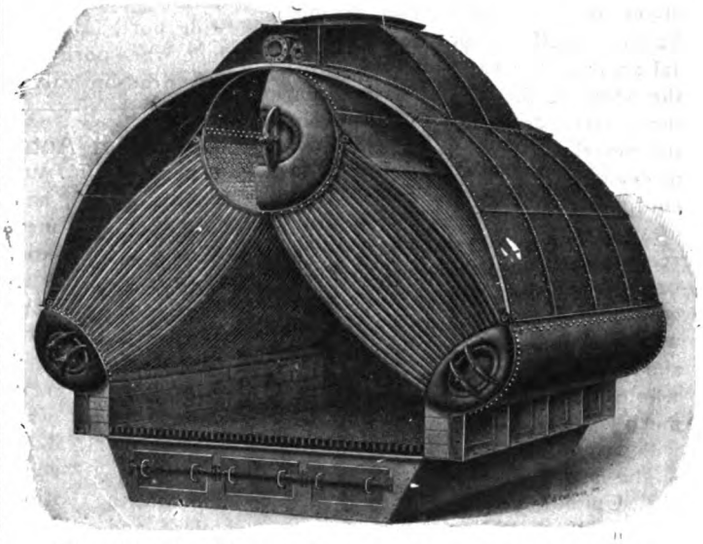

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Auxiliary and Engineering Specialties

The Porhydrometer

Among the auxiliaries exhibited at the annual meeting of the Lake Carriers' Association at Detroit, none attracted as much attention as the porhydrometer. The display consisted of a model of a ship floating in a tank with the porhydrometer installed. This instrument was described in the September, 1909, MARINE REVIEW and is the invention of an Italian engineer. Everybody who inspected the model was much impressed with its simplicity and scientific accuracy. The porhydrometer is simply an adaptation of the laws of nature governing displacement and water level. It is really an indication of the vessel's own displacement and virtually turns the ship into a weighing machine. It consists of a small steelyard attached to an aerometer or float which measures accurately any alteration in the displacement due to weight, placed or removed from aboard. The aerometer is suspended inside an iron pipe placed in the center of the vessel into which the sea water has free access and rises to a level corresponding to the draught of the ship. The pipe extends well below the light water line to well above the load line. The aerometer having exactly proportionate horizontal areas at the various immersions to the areas of the planes of flotation at the present draughts or immersion of the vessel, has an exactly similar displacement and thereby reduces the enormous weights dealt with to a measurable quantity. The trim of the vessel, whether lying on an even keel or not, does not affect the accuracy of the porhydrometer. It weighs with unfailing accuracy anything put aboard, whether forward or aft. The whole apparatus does not occupy much space and its weight, all told, will vary from 200 to 600 pounds.

The sole agents for the device in the United States are the McNab Co., Bridgeport, Conn.

Schuette Recording Compass

The recording compass manufactured by the Schuette Recording Compass Co., Manitowoc, Wis., is daily receiving additional endorsement. The recording compass is attracting a great deal of attention abroad and has been ordered by a number of leading steamship lines. A number of vessel owners who saw the compass at the exhibition of auxiliaries in conjunction with the Lake Carriers' meeting at Detroit were much impressed with it and orders for the compass will undoubtedly be placed by them. It is an infallible record of what occurs in the wheelhouse during the 24 hours of the day.

McNab Engine Indicators

Alexander McNab, the inventor of the McNab direction and revolution indicators which have met with so much success in this country, attended the annual meeting of the Lake Carriers' Association. The McNab indicator is a very simple little device which indicates whether the engine is going ahead or astern and in such a manner that there is no possibility of a mistake. Mr. McNab has received a number of testimonials regarding his indicator. In fact, a number of the leading lake fleets have adopted it and it is extensively used also on the coast.

Mr. McNab has extended his company to include a number of nautical and engineering appliances, and has changed the name of the company from the McNab Indicator Co. to the McNab Co., with headquarters at Bridgeport, Conn. The specialties include the porhydrometer and Downie's dead-lip valve.

The Eckliff Automatic Circulator

The Eckliff Automatic Circulator Co., of Detroit, had a very attractive display at the meeting of the Lake Carriers' Association, in Detroit, showing a model of their circulator installed on a model boiler. The little model certainly attended to business all the time and was watched with interest by a great many engineers. This circulator was described in the October, 1911, MARINE REVIEW, and its purpose is to equalize the temperature in the bottom and top of the boiler and thereby eliminate the trouble caused by leaky, circumferential seams and the pitting and cracking of furnace bottoms. It is expected that the circulator will be installed on a number of lake freighters before the season of 1912.

Nautical Library

One of the most enterprising exhibitions at the Lake Carriers' meeting was the nautical library compiled by Burrows Bros. Co., of Cleveland. Evidently it was got up on the spur of the moment because a number of standard works were missing from the display, but it was nevertheless a step in the right direction. The leading vessel interests as a rule are quite willing to furnish the men aboard ship anything in the way of literature that they may deem helpful to them in their business. The larger class of carriers have very excellent libraries.

Marine Searchlights

Lake masters are practically a unit in maintaining that lake vessels should be equipped with searchlights. What is needed is a more powerful light than the simple little handlight that is carried on several of them, as it is quite important at times that stakes and other unlighted aids to navigation be picked up promptly. The Carlisle & Finch Co., Cincinnati, O., are just sending out a catalog illustrating their searchlight projectors. Their marine projectors are of great power, being equipped with glass lens mirrors, the curvature of which concentrates the light from the arc so that it emerges from the lamp in a practically straight ray. A focusing screw and hand-wheel are provided for varying the spread of the light. The weight of the projectors is carried on a train of steel balls so that the lamp may be turned in either direction with the greatest ease. The effective range of the 9-in. projector is said to be from ½ to ¾ miles, the 14-in. projector from 1 to 1½ miles, the 24-in. projector 3 miles and the 38-in. projector 5 miles.

Meno Message Case

An interesting little booklet entitled "Lost Ships" was distributed by the Meno Message Case Co., Detroit, Mich., at the meeting of the Lake Carriers' Association. This little booklet gives a list of the mysterious total losses of the great lakes. It is known that there have been many such, notably the Western Reserve, Gilcher, Kaliyuga, Clemson, Cyprus and Pere Marquette 18. The point of the little booklet is that if the Meno message case had been carried aboard some message detailing the cause of the disaster might have reached the shore. Some interesting experiments have been made

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